

SEQUENZPROTOKOLL

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<110> Bayer Aktiengesellschaft

<120> Nucleinsäuren, die für Enzymaktivitäten der
Spinosa-Biosynthese codieren

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<151> 1999-08-27

<150> DE 199 57 268.2

<151> 1999-11-29

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<170> PatentIn Ver. 2.1

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<210> 7

<211> 828

<212> DNA

<213> *Saccharopolyspora spinosa*

<220>

<221> CDS

<222> (1) .. (825)

<223> ORF1; O-Methyltransferase

<400> 7

gtg ttg cca ggt ggc gca cca aca tcg cag cag gtt ggg cag atg tat 48
 Val Leu Pro Gly Gly Ala Pro Thr Ser Gln Gln Val Gly Gln Met Tyr
 1 5 10 15
 gac ctg gtc acg ccg ttg ctg aac tcg gtc gcg ggc ggc ccc tgc gcc 96
 Asp Leu Val Thr Pro Leu Leu Asn Ser Val Ala Gly Gly Pro Cys Ala
 20 25 30
 atc cac cac ggc tac tgg gag aac gac ggg cgg gct tcc tgg cag cag 144

Ile His His Gly Tyr Trp Glu Asn Asp Gly Arg Ala Ser Trp Gln Gln
35 40 45

gcc gcc gac cgg ctc acc gac ctt gtc gcc gaa cgg acc gtg ctc gat 192
Ala Ala Asp Arg Leu Thr Asp Leu Val Ala Glu Arg Thr Val Leu Asp
50 55 60

ggc ggc gtt cga ctg ctc gat gtg ggg tgc ggt acc gga caa cca gcg 240
Gly Gly Val Arg Leu Leu Asp Val Gly Cys Gly Thr Gly Gln Pro Ala
65 70 75 80

ctg cgc gtc gcg cgc gac aac gcg atc cag atc acc ggc atc acc gtc 288
Leu Arg Val Ala Arg Asp Asn Ala Ile Gln Ile Thr Gly Ile Thr Val
85 90 95

agc cag gtg caa gtg gcc atc gcc gct gat tgc gca cgc gaa cgc gga 336
Ser Gln Val Gln Val Ala Ile Ala Ala Asp Cys Ala Arg Glu Arg Gly
100 105 110

cta agc cac cgg gtg gac ttc tcg tgc gtc gat gcc atg tcc ctg ccg 384
Leu Ser His Arg Val Asp Phe Ser Cys Val Asp Ala Met Ser Leu Pro
115 120 125

tac ccg gac aat gct ttc gac gcc gcc tgg gcc atg cag tcg ctg ttg 432
Tyr Pro Asp Asn Ala Phe Asp Ala Ala Trp Ala Met Gln Ser Leu Leu
130 135 140

gag atg tcc gaa ccg gac cgt gcc atc cgg gaa atc ctt cga gta ctc 480
Glu Met Ser Glu Pro Asp Arg Ala Ile Arg Glu Ile Leu Arg Val Leu
145 150 155 160

aaa ccc ggt ggc atc ctc ggc gtc acc gag gtc gtc aaa cga gaa gcg 528
Lys Pro Gly Gly Ile Leu Gly Val Thr Glu Val Val Lys Arg Glu Ala
165 170 175

ggc ggc ggg atg ccg gtg tcc ggg gac agg tgg ccg acc ggc ctt cgg 576
Gly Gly Gly Met Pro Val Ser Gly Asp Arg Trp Pro Thr Gly Leu Arg
180 185 190

atc tgc ctg gct gag caa ctt ctg gaa tcg ctg cgt gca gcg ggg ttc 624
Ile Cys Leu Ala Glu Gln Leu Leu Glu Ser Leu Arg Ala Ala Gly Phe
195 200 205

gag atc ctc gat tgg gag gac gtg tcg tcg agg acc cgg tac ttc atg 672
Glu Ile Leu Asp Trp Glu Asp Val Ser Ser Arg Thr Arg Tyr Phe Met
210 215 220

ccg cag ttc gcc gaa gag ctc gct gcg cac cag cac ggg atc gcg gac 720

Pro Gln Phe Ala Glu Glu Leu Ala Ala His Gln His Gly Ile Ala Asp
 225 230 235 240

agg tac ggg ccg gct gtc gcc ggc tgg gcc gcc gcg gtc tgc gat tat 768
 Arg Tyr Gly Pro Ala Val Ala Gly Trp Ala Ala Ala Val Cys Asp Tyr
 245 250 255

gag aaa tat gcc cac gac atg ggc tat gcg att ctg acg gcg cgg aag 816
 Glu Lys Tyr Ala His Asp Met Gly Tyr Ala Ile Leu Thr Ala Arg Lys
 260 265 270

ccg gtc ggc tga 828
 Pro Val Gly
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<210> 8

<211> 275

<212> PRT

<213> Saccharopolyspora spinosa

<400> 8

Val Leu Pro Gly Gly Ala Pro Thr Ser Gln Gln Val Gly Gln Met Tyr
 1 5 10 15

Asp Leu Val Thr Pro Leu Leu Asn Ser Val Ala Gly Gly Pro Cys Ala
 20 25 30

Ile His His Gly Tyr Trp Glu Asn Asp Gly Arg Ala Ser Trp Gln Gln
 35 40 45

Ala Ala Asp Arg Leu Thr Asp Leu Val Ala Glu Arg Thr Val Leu Asp
 50 55 60

Gly Gly Val Arg Leu Leu Asp Val Gly Cys Gly Thr Gly Gln Pro Ala
 65 70 75 80

Leu Arg Val Ala Arg Asp Asn Ala Ile Gln Ile Thr Gly Ile Thr Val
 85 90 95

Ser Gln Val Gln Val Ala Ile Ala Ala Asp Cys Ala Arg Glu Arg Gly
 100 105 110

Leu Ser His Arg Val Asp Phe Ser Cys Val Asp Ala Met Ser Leu Pro
 115 120 125

Tyr Pro Asp Asn Ala Phe Asp Ala Ala Trp Ala Met Gln Ser Leu Leu
 130 135 140

Glu Met Ser Glu Pro Asp Arg Ala Ile Arg Glu Ile Leu Arg Val Leu
 145 150 155 160

Lys Pro Gly Gly Ile Leu Gly Val Thr Glu Val Val Lys Arg Glu Ala
 165 170 175

Gly Gly Gly Met Pro Val Ser Gly Asp Arg Trp Pro Thr Gly Leu Arg
 180 185 190

Ile Cys Leu Ala Glu Gln Leu Leu Glu Ser Leu Arg Ala Ala Gly Phe
 195 200 205

Glu Ile Leu Asp Trp Glu Asp Val Ser Ser Arg Thr Arg Tyr Phe Met
 210 215 220

Pro Gln Phe Ala Glu Glu Leu Ala Ala His Gln His Gly Ile Ala Asp
 225 230 235 240

Arg Tyr Gly Pro Ala Val Ala Gly Trp Ala Ala Ala Val Cys Asp Tyr
 245 250 255

Glu Lys Tyr Ala His Asp Met Gly Tyr Ala Ile Leu Thr Ala Arg Lys
 260 265 270

Pro Val Gly
 275

<210> 9

<211> 1173

<212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1)..(1170)

<223> ORF2; Glycosyltransferase

<400> 9

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 1 5 10 15

atg gtg ccg ctg tgc tgg gcg ctg caa gca tcc ggg cac gag gtc ctg 96
 Met Val Pro Leu Cys Trp Ala Leu Gln Ala Ser Gly His Glu Val Leu
 20 25 30

atc gcc gca cca cca gag ctg cag gcg acc gcg cat ggt gca ggt ctc	144
Ile Ala Ala Pro Pro Glu Leu Gln Ala Thr Ala His Gly Ala Gly Leu	
35 40 45	
acc acg gcc ggg atc cgc ggg aac gac agg acc ggc gat acg ggt gga	192
Thr Thr Ala Gly Ile Arg Gly Asn Asp Arg Thr Gly Asp Thr Gly Gly	
50 55 60	
acc acg cag ctg cgc ttt ccc aat ccg gcg ttc ggt cag cgc gac acc	240
Thr Thr Gln Leu Arg Phe Pro Asn Pro Ala Phe Gly Gln Arg Asp Thr	
65 70 75 80	
gag gca ggc cgg caa ctg tgg gag cag acc gcg tcc aat gtc gcg caa	288
Glu Ala Gly Arg Gln Leu Trp Glu Gln Thr Ala Ser Asn Val Ala Gln	
85 90 95	
agc tcg ctc gat cag ctc ccc gaa tac ctt cga ctg gcc gag gcc tgg	336
Ser Ser Leu Asp Gln Leu Pro Glu Tyr Leu Arg Leu Ala Glu Ala Trp	
100 105 110	
cga ccg tca gtg ctg ttg gtc gac gtc tgc gcg ctg atc ggc cgg gtg	384
Arg Pro Ser Val Leu Leu Val Asp Val Cys Ala Leu Ile Gly Arg Val	
115 120 125	
ctc ggc gga ttg ctc gac ctg ccg gtc gtg ctg cac cgc tgg gga gtc	432
Leu Gly Gly Leu Leu Asp Leu Pro Val Val Leu His Arg Trp Gly Val	
130 135 140	
gac ccc acc gca ggc ccc ttc agc gat cga gcc cac gag ttg ctt gac	480
Asp Pro Thr Ala Gly Pro Phe Ser Asp Arg Ala His Glu Leu Leu Asp	
145 150 155 160	
ccg gtg tgc cgg cac cac gga ctg acc ggc ctg ccc act ccc gag ctc	528
Pro Val Cys Arg His His Gly Leu Thr Gly Leu Pro Thr Pro Glu Leu	
165 170 175	
atc ctc gat ccc tgt ccg ccg agc ctg caa gca agc gac gcg ccg caa	576
Ile Leu Asp Pro Cys Pro Pro Ser Leu Gln Ala Ser Asp Ala Pro Gln	
180 185 190	
ggc gca ccg gtc cag tac gtg ccg tac aac gga agc ggc gca ttc ccg	624
Gly Ala Pro Val Gln Tyr Val Pro Tyr Asn Gly Ser Gly Ala Phe Pro	
195 200 205	
gca tgg ggc gcg gcg cgc acc tca gca cgg cgg gtc tgc atc tgc atg	672
Ala Trp Gly Ala Ala Arg Thr Ser Ala Arg Arg Val Cys Ile Cys Met	
210 215 220	

ggc cgc atg gtg ctg aac gcc acc ggg ccg gct ccg ctg ctg cgc gca 720
 Gly Arg Met Val Leu Asn Ala Thr Gly Pro Ala Pro Leu Leu Arg Ala
 225 230 235 240

gta gcg gct gcc acc gag ttg ccc ggc gtc gag gcc gtg atc gcc gtt 768
 Val Ala Ala Ala Thr Glu Leu Pro Gly Val Glu Ala Val Ile Ala Val
 245 250 255

ccc ccc gag cac ccg gca ctt ctc acc gac cta ccc gac aac gcc ccg 816
 Pro Pro Glu His Arg Ala Leu Leu Thr Asp Leu Pro Asp Asn Ala Arg
 260 265 270

atc gcc gaa tcg gtc ccg ctc aac ctg ttc ctg cgt acc tgc gag ctg 864
 Ile Ala Glu Ser Val Pro Leu Asn Leu Phe Leu Arg Thr Cys Glu Leu
 275 280 285

gtc atc tgc gcg ggc ggc tcg gga acg gca ttc acc gcg acc cga ctc 912
 Val Ile Cys Ala Gly Gly Ser Gly Thr Ala Phe Thr Ala Thr Arg Leu
 290 295 300

ggc atc ccg caa ctc gtg ctt ccc cag tac ttc gac cag ttc gac tac 960
 Gly Ile Pro Gln Leu Val Leu Pro Gln Tyr Phe Asp Gln Phe Asp Tyr
 305 310 315 320

gcg cgc aac ctc gcc gct gcc ggg gcg ggc atc tgc ttg ccg gat gag 1008
 Ala Arg Asn Leu Ala Ala Ala Gly Ala Gly Ile Cys Leu Pro Asp Glu
 325 330 335

cag gcc cag tcc gac cac gaa cag ttc acc gac tca atc gca acg gtg 1056
 Gln Ala Gln Ser Asp His Glu Gln Phe Thr Asp Ser Ile Ala Thr Val
 340 345 350

ctc ggc gac acc ggc ttc gct gct gcg gca atc aaa ctc agc gac gag 1104
 Leu Gly Asp Thr Gly Phe Ala Ala Ala Ala Ile Lys Leu Ser Asp Glu
 355 360 365

atc acg gcc atg ccc cat ccc gcc gcg ctg gtg ccg acg ctg gag aac 1152
 Ile Thr Ala Met Pro His Pro Ala Ala Leu Val Arg Thr Leu Glu Asn
 370 375 380

act gcg gcc atc cgt gcc tga 1173
 Thr Ala Ala Ile Arg Ala
 385 390

<210> 10

<211> 390

<212> PRT

<213> *Saccharopolyspora spinosa*

<400> 10

Met Arg Val Leu Val Val Pro Leu Pro Tyr Pro Thr His Leu Met Ala
 1 5 10 15

Met Val Pro Leu Cys Trp Ala Leu Gln Ala Ser Gly His Glu Val Leu
 20 25 30

Ile Ala Ala Pro Pro Glu Leu Gln Ala Thr Ala His Gly Ala Gly Leu
 35 40 45

Thr Thr Ala Gly Ile Arg Gly Asn Asp Arg Thr Gly Asp Thr Gly Gly
 50 55 60

Thr Thr Gln Leu Arg Phe Pro Asn Pro Ala Phe Gly Gln Arg Asp Thr
 65 70 75 80

Glu Ala Gly Arg Gln Leu Trp Glu Gln Thr Ala Ser Asn Val Ala Gln
 85 90 95

Ser Ser Leu Asp Gln Leu Pro Glu Tyr Leu Arg Leu Ala Glu Ala Trp
 100 105 110

Arg Pro Ser Val Leu Leu Val Asp Val Cys Ala Leu Ile Gly Arg Val
 115 120 125

Leu Gly Gly Leu Leu Asp Leu Pro Val Val Leu His Arg Trp Gly Val
 130 135 140

Asp Pro Thr Ala Gly Pro Phe Ser Asp Arg Ala His Glu Leu Leu Asp
 145 150 155 160

Pro Val Cys Arg His His Gly Leu Thr Gly Leu Pro Thr Pro Glu Leu
 165 170 175

Ile Leu Asp Pro Cys Pro Pro Ser Leu Gln Ala Ser Asp Ala Pro Gln
 180 185 190

Gly Ala Pro Val Gln Tyr Val Pro Tyr Asn Gly Ser Gly Ala Phe Pro
 195 200 205

Ala Trp Gly Ala Ala Arg Thr Ser Ala Arg Arg Val Cys Ile Cys Met
 210 215 220

Gly Arg Met Val Leu Asn Ala Thr Gly Pro Ala Pro Leu Leu Arg Ala
 225 230 235 240

Val Ala Ala Ala Thr Glu Leu Pro Gly Val Glu Ala Val Ile Ala Val
245 250 255

Pro Pro Glu His Arg Ala Leu Leu Thr Asp Leu Pro Asp Asn Ala Arg
260 265 270

Ile Ala Glu Ser Val Pro Leu Asn Leu Phe Leu Arg Thr Cys Glu Leu
275 280 285

Val Ile Cys Ala Gly Gly Ser Gly Thr Ala Phe Thr Ala Thr Arg Leu
290 295 300

Gly Ile Pro Gln Leu Val Leu Pro Gln Tyr Phe Asp Gln Phe Asp Tyr
305 310 315 320

Ala Arg Asn Leu Ala Ala Ala Gly Ala Gly Ile Cys Leu Pro Asp Glu
325 330 335

Gln Ala Gln Ser Asp His Glu Gln Phe Thr Asp Ser Ile Ala Thr Val
340 345 350

Leu Gly Asp Thr Gly Phe Ala Ala Ala Ile Lys Leu Ser Asp Glu
355 360 365

Ile Thr Ala Met Pro His Pro Ala Ala Leu Val Arg Thr Leu Glu Asn
370 375 380

Thr Ala Ala Ile Arg Ala
385 390

<210> 11

<211> 753

<212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1)..(750)

<223> ORF3; O-Methyltransferase

<400> 11

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Met Pro Ser Gln Asn Ala Leu Tyr Leu Asp Leu Leu Lys Lys Val Leu
1 5 10 15

acc aac acg att tac agt gat cgg ccg cat ccg aac gcc tgg cag gac	96
Thr Asn Thr Ile Tyr Ser Asp Arg Pro His Pro Asn Ala Trp Gln Asp	
20 25 30	
aac acc gac tac agg cag gcc gct cgg gcc aaa ggc acg gac tgg cca	144
Asn Thr Asp Tyr Arg Gln Ala Ala Arg Ala Lys Gly Thr Asp Trp Pro	
35 40 45	
act gtc gcg cac acg atg atc ggt ctg gag cgg ctg gac aac ctc cag	192
Thr Val Ala His Thr Met Ile Gly Leu Glu Arg Leu Asp Asn Leu Gln	
50 55 60	
cac tgc gtg gaa gcc gtg ctc gca gac ggt gtt ccc ggg gat ttc gcc	240
His Cys Val Glu Ala Val Leu Ala Asp Gly Val Pro Gly Asp Phe Ala	
65 70 75 80	
gag acc ggt gtc tgg cgg ggc ggc gca tgc atc ttc atg cgc gcg gtt	288
Glu Thr Gly Val Trp Arg Gly Gly Ala Cys Ile Phe Met Arg Ala Val	
85 90 95	
ctc cag gca ttc gga gat acc gga cgt acc gtc tgg gta gtg gat tcc	336
Leu Gln Ala Phe Gly Asp Thr Gly Arg Thr Val Trp Val Val Asp Ser	
100 105 110	
ttc cag gga atg ccg gaa agc tct gcg caa gac cac caa gcg gac cag	384
Phe Gln Gly Met Pro Glu Ser Ser Ala Gln Asp His Gln Ala Asp Gln	
115 120 125	
gct atg gcg ctg cac gag tac aac gac gtg ctt ggc gta tcg ctt gag	432
Ala Met Ala Leu His Glu Tyr Asn Asp Val Leu Gly Val Ser Leu Glu	
130 135 140	
acc gtc cgg cag aac ttc gcc cgc tac ggg ctg ctc gac gaa cag gtc	480
Thr Val Arg Gln Asn Phe Ala Arg Tyr Gly Leu Leu Asp Glu Gln Val	
145 150 155 160	
agg ttc ctc ccc ggc tgg ttc cgg gac acc ttg ccc acc gcc ccc atc	528
Arg Phe Leu Pro Gly Trp Phe Arg Asp Thr Leu Pro Thr Ala Pro Ile	
165 170 175	
cag gaa ctc gcc gtg cta cga ctc gac ggc gac ctc tac gaa tcc aca	576
Gln Glu Leu Ala Val Leu Arg Leu Asp Gly Asp Leu Tyr Glu Ser Thr	
180 185 190	
atg gac tca ttg cgg aac ctg tac ccg aag ctc tcg ccg ggc gga ttc	624
Met Asp Ser Leu Arg Asn Leu Tyr Pro Lys Leu Ser Pro Gly Gly Phe	
195 200 205	

gtc atc atc gac gac tat ttt ctg ccg tcc tgc cag gac gcg gtg aag 672
 Val Ile Ile Asp Asp Tyr Phe Leu Pro Ser Cys Gln Asp Ala Val Lys
 210 215 220

ggg ttc cgc gcg gaa ctc ggg atc acg gaa ccc atc cac gac atc gac 720
 Gly Phe Arg Ala Glu Leu Gly Ile Thr Glu Pro Ile His Asp Ile Asp
 225 230 235 240

ggc acg ggc gcc tac tgg cgc cgc agc tgg tga 753
 Gly Thr Gly Ala Tyr Trp Arg Arg Ser Trp
 245 250

<210> 12

<211> 250

<212> PRT

<213> Saccharopolyspora spinosa

<400> 12

Met Pro Ser Gln Asn Ala Leu Tyr Leu Asp Leu Leu Lys Lys Val Leu
 1 5 10 15

Thr Asn Thr Ile Tyr Ser Asp Arg Pro His Pro Asn Ala Trp Gln Asp
 20 25 30

Asn Thr Asp Tyr Arg Gln Ala Ala Arg Ala Lys Gly Thr Asp Trp Pro
 35 40 45

Thr Val Ala His Thr Met Ile Gly Leu Glu Arg Leu Asp Asn Leu Gln
 50 55 60

His Cys Val Glu Ala Val Leu Ala Asp Gly Val Pro Gly Asp Phe Ala
 65 70 75 80

Glu Thr Gly Val Trp Arg Gly Gly Ala Cys Ile Phe Met Arg Ala Val
 85 90 95

Leu Gln Ala Phe Gly Asp Thr Gly Arg Thr Val Trp Val Val Asp Ser
 100 105 110

Phe Gln Gly Met Pro Glu Ser Ser Ala Gln Asp His Gln Ala Asp Gln
 115 120 125

Ala Met Ala Leu His Glu Tyr Asn Asp Val Leu Gly Val Ser Leu Glu
 130 135 140

Thr Val Arg Gln Asn Phe Ala Arg Tyr Gly Leu Leu Asp Glu Gln Val
 145 150 155 160

Arg Phe Leu Pro Gly Trp Phe Arg Asp Thr Leu Pro Thr Ala Pro Ile
 165 170 175

Gln Glu Leu Ala Val Leu Arg Leu Asp Gly Asp Leu Tyr Glu Ser Thr
 180 185 190

Met Asp Ser Leu Arg Asn Leu Tyr Pro Lys Leu Ser Pro Gly Gly Phe
 195 200 205

Val Ile Ile Asp Asp Tyr Phe Leu Pro Ser Cys Gln Asp Ala Val Lys
 210 215 220

Gly Phe Arg Ala Glu Leu Gly Ile Thr Glu Pro Ile His Asp Ile Asp
 225 230 235 240

Gly Thr Gly Ala Tyr Trp Arg Arg Ser Trp
 245 250

<210> 13

<211> 1188

<212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1)..(1185)

<223> ORF4; O-Methyltransferase

<400> 13

atg agt gag atc gca gtt gcc ccc tgg tcg gtg gtg gag cgt ttg ctg 48
 Met Ser Glu Ile Ala Val Ala Pro Trp Ser Val Val Glu Arg Leu Leu
 1 5 10 15

ctc gcg gcg ggt gcg ggc ccg gcg aag ctc cag gaa gca gtg cag gtg 96
 Leu Ala Ala Gly Ala Gly Pro Ala Lys Leu Gln Glu Ala Val Gln Val
 20 25 30

gcc gga ctg gac gcg gtg gcc gac gcc atc gtc gac gaa ctc gtc gta 144
 Ala Gly Leu Asp Ala Val Ala Asp Ala Ile Val Asp Glu Leu Val Val
 35 40 45

cgc tgc gat ccg ctg tcg ttg gac gag tcg gtg cga atc ggc ctg gag 192
 Arg Cys Asp Pro Leu Ser Leu Asp Glu Ser Val Arg Ile Gly Leu Glu
 50 55 60

atc act tct ggc gct cag ctg gtc cgg aga acc gtt gag ctc gat cac	240
Ile Thr Ser Gly Ala Gln Leu Val Arg Arg Thr Val Glu Leu Asp His	
65 70 75 80	
gca ggc ctg cgg ctc gcg gcg gtc gcc gaa gca gct gct gtt ctc cgg	288
Ala Gly Leu Arg Leu Ala Ala Val Ala Glu Ala Ala Ala Val Leu Arg	
85 90 95	
ttc gac gcg gtg gat ctg ctg gaa ggg ctc ttc ggc ccg gtt gac ggc	336
Phe Asp Ala Val Asp Leu Leu Glu Gly Leu Phe Gly Pro Val Asp Gly	
100 105 110	
agg cgg cac aac agc cgt gaa gtc cgc tgg tcg gac agc atg acg cag	384
Arg Arg His Asn Ser Arg Glu Val Arg Trp Ser Asp Ser Met Thr Gln	
115 120 125	
ttc tcg ccc gac cag ggc ctc gcc ggc gcg cag cgc ctg ctg gcg ttc	432
Phe Ser Pro Asp Gln Gly Leu Ala Gly Ala Gln Arg Leu Leu Ala Phe	
130 135 140	
cgg aac agg gtg tcc acc gcg gtg cac gcc gtg ctg gcc gca gcc gcc	480
Arg Asn Arg Val Ser Thr Ala Val His Ala Val Leu Ala Ala Ala Ala	
145 150 155 160	
acc agg cgc gcg gac ctc ggt gcg ctg gca gtc cgc tac gga tcc gac	528
Thr Arg Arg Ala Asp Leu Gly Ala Leu Ala Val Arg Tyr Gly Ser Asp	
165 170 175	
aaa tgg gcg gac ctg cac tgg tac acc gaa cac tac gag cac cac ttc	576
Lys Trp Ala Asp Leu His Trp Tyr Thr Glu His Tyr Glu His His Phe	
180 185 190	
tcc cga ttc cag gat gcc ccg gtg cga gtg ttg gaa ata gga atc ggt	624
Ser Arg Phe Gln Asp Ala Pro Val Arg Val Leu Glu Ile Gly Ile Gly	
195 200 205	
ggt tat cac gca ccc gaa ctc ggt ggt gct tcg ctg cgc atg tgg cag	672
Gly Tyr His Ala Pro Glu Leu Gly Gly Ala Ser Leu Arg Met Trp Gln	
210 215 220	
cgg tac ttc cgg cga ggt ctc gtt tac ggg ctg gac att ttc gag aaa	720
Arg Tyr Phe Arg Arg Gly Leu Val Tyr Gly Leu Asp Ile Phe Glu Lys	
225 230 235 240	
gcc ggg aac gaa ggg cac cga gtg cga aag ctg cga ggt gac cag agc	768
Ala Gly Asn Glu Gly His Arg Val Arg Lys Leu Arg Gly Asp Gln Ser	
245 250 255	

WO 01/16303

gat gcg gaa ttc ctg gaa gac atg gcg ggg aag atc ggg ccg ttc gac 816
 Asp Ala Glu Phe Leu Glu Asp Met Ala Gly Lys Ile Gly Pro Phe Asp
 260 265 270

att gtc atc gac gac ggc agc cat gtc aac gac cac gtc aag aaa tcc 864
 Ile Val Ile Asp Asp Gly Ser His Val Asn Asp His Val Lys Lys Ser
 275 280 285

ttc caa tcc ctg ttt ccg cac gtc cgc cca ggt ggt ttg tac gtc atc 912
 Phe Gln Ser Leu Phe Pro His Val Arg Pro Gly Gly Leu Tyr Val Ile
 290 295 300

gag gat ctc cag acg gcg tac tgg ccc ggc tac ggc ggt cgc gat ggg 960
 Glu Asp Leu Gln Thr Ala Tyr Trp Pro Gly Tyr Gly Gly Arg Asp Gly
 305 310 315 320

gaa ccc gcg gcc cag cgc acc tcg atc gac atg ctc aaa gaa ctg atc 1008
 Glu Pro Ala Ala Gln Arg Thr Ser Ile Asp Met Leu Lys Glu Leu Ile
 325 330 335

gac ggc ctg cat tat cag gag cgc gaa tcg cgg tgc ggg acc gag ccc 1056
 Asp Gly Leu His Tyr Gln Glu Arg Glu Ser Arg Cys Gly Thr Glu Pro
 340 345 350

tcc tac acg gaa cgg aac gtg gcg gcc ctg cac ttc tac cac aac ctg 1104
 Ser Tyr Thr Glu Arg Asn Val Ala Ala Leu His Phe Tyr His Asn Leu
 355 360 365

gta ttc gtg gag aaa ggg ctc aac gct gag cct gcc gcg ccg ggg ttc 1152
 Val Phe Val Glu Lys Gly Leu Asn Ala Glu Pro Ala Ala Pro Gly Phe
 370 375 380

gtg ccc cgg caa gcg ctc ggc gtc gag gac ggc tga 1188
 Val Pro Arg Gln Ala Leu Gly Val Glu Asp Gly
 385 390 395

<210> 14

<211> 395

<212> PRT

<213> Saccharopolyspora spinosa

<400> 14

Met Ser Glu Ile Ala Val Ala Pro Trp Ser Val Val Glu Arg Leu Leu
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Leu Ala Ala Gly Ala Gly Pro Ala Lys Leu Gln Glu Ala Val Gln Val
 20 25 30

Ala Gly Leu Asp Ala Val Ala Asp Ala Ile Val Asp Glu Leu Val Val
 35 40 45
 Arg Cys Asp Pro Leu Ser Leu Asp Glu Ser Val Arg Ile Gly Leu Glu
 50 55 60
 Ile Thr Ser Gly Ala Gln Leu Val Arg Arg Thr Val Glu Leu Asp His
 65 70 75 80
 Ala Gly Leu Arg Leu Ala Ala Val Ala Glu Ala Ala Ala Val Leu Arg
 85 90 95
 Phe Asp Ala Val Asp Leu Leu Glu Gly Leu Phe Gly Pro Val Asp Gly
 100 105 110
 Arg Arg His Asn Ser Arg Glu Val Arg Trp Ser Asp Ser Met Thr Gln
 115 120 125
 Phe Ser Pro Asp Gln Gly Leu Ala Gly Ala Gln Arg Leu Leu Ala Phe
 130 135 140
 Arg Asn Arg Val Ser Thr Ala Val His Ala Val Leu Ala Ala Ala Ala
 145 150 155 160
 Thr Arg Arg Ala Asp Leu Gly Ala Leu Ala Val Arg Tyr Gly Ser Asp
 165 170 175
 Lys Trp Ala Asp Leu His Trp Tyr Thr Glu His Tyr Glu His His Phe
 180 185 190
 Ser Arg Phe Gln Asp Ala Pro Val Arg Val Leu Glu Ile Gly Ile Gly
 195 200 205
 Gly Tyr His Ala Pro Glu Leu Gly Gly Ala Ser Leu Arg Met Trp Gln
 210 215 220
 Arg Tyr Phe Arg Arg Gly Leu Val Tyr Gly Leu Asp Ile Phe Glu Lys
 225 230 235 240
 Ala Gly Asn Glu Gly His Arg Val Arg Lys Leu Arg Gly Asp Gln Ser
 245 250 255
 Asp Ala Glu Phe Leu Glu Asp Met Ala Gly Lys Ile Gly Pro Phe Asp
 260 265 270
 Ile Val Ile Asp Asp Gly Ser His Val Asn Asp His Val Lys Lys Ser
 275 280 285

Phe Gln Ser Leu Phe Pro His Val Arg Pro Gly Gly Leu Tyr Val Ile
 290 295 300
 Glu Asp Leu Gln Thr Ala Tyr Trp Pro Gly Tyr Gly Gly Arg Asp Gly
 305 310 315 320
 Glu Pro Ala Ala Gln Arg Thr Ser Ile Asp Met Leu Lys Glu Leu Ile
 325 330 335
 Asp Gly Leu His Tyr Gln Glu Arg Glu Ser Arg Cys Gly Thr Glu Pro
 340 345 350
 Ser Tyr Thr Glu Arg Asn Val Ala Ala Leu His Phe Tyr His Asn Leu
 355 360 365
 Val Phe Val Glu Lys Gly Leu Asn Ala Glu Pro Ala Ala Pro Gly Phe
 370 375 380
 Val Pro Arg Gln Ala Leu Gly Val Glu Asp Gly
 385 390 395

<210> 15

<211> 1620

<212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1)..(1617)

<223> ORF5; C-C verknüpfendes Enzym, Cyclisierungsenzym

<400> 15

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 Met Ile Ser Ala Ala Gly Glu Gln Ser Gly Pro Val Arg Lys Gly Gly
 1 5 10 15
 gcg gtg ccc gaa ttc cat gac ccg gca ccc atg aat cgt cga acc cca 96
 Ala Val Pro Glu Phe His Asp Pro Ala Pro Met Asn Arg Arg Thr Pro
 20 25 30
 gga aca gag atc acc gtc gag ccc gac gat cct cgt tat ccg gac ctc 144
 Gly Thr Glu Ile Thr Val Glu Pro Asp Asp Pro Arg Tyr Pro Asp Leu
 35 40 45
 gtc gtc ggg cac aac ccc cgt ttc acc gga aaa ccc gaa cgc atc cac 192

Val	Val	Gly	His	Asn	Pro	Arg	Phe	Thr	Gly	Lys	Pro	Glu	Arg	Ile	His	
50						55					60					
atc	gcc	agc	tcc	gcc	gaa	gac	gtc	gtg	cac	gcc	gtc	gcc	gac	gcc	gtg	240
Ile	Ala	Ser	Ser	Ala	Glu	Asp	Val	Val	His	Ala	Val	Ala	Asp	Ala	Val	
65					70					75					80	
cgc	acc	ggc	agg	cgg	gta	ggg	gtc	cgc	agc	ggc	ggg	cac	tgc	ttc	gag	288
Arg	Thr	Gly	Arg	Arg	Val	Gly	Val	Arg	Ser	Gly	Gly	His	Cys	Phe	Glu	
				85				90						95		
aat	ctc	gtt	gcg	gac	ccg	gcg	atc	cga	gtg	ctc	gtc	gac	ctc	tcc	gag	336
Asn	Leu	Val	Ala	Asp	Pro	Ala	Ile	Arg	Val	Leu	Val	Asp	Leu	Ser	Glu	
			100					105						110		
ctc	aac	cgc	gtg	tac	tac	gac	agc	acg	cgc	ggg	gca	ttc	gcg	atc	gag	384
Leu	Asn	Arg	Val	Tyr	Tyr	Asp	Ser	Thr	Arg	Gly	Ala	Phe	Ala	Ile	Glu	
			115					120					125			
gcg	ggc	gcc	gcc	ctc	ggg	cag	gtg	tac	cga	acc	ctg	ttc	aag	aac	tgg	432
Ala	Gly	Ala	Ala	Leu	Gly	Gln	Val	Tyr	Arg	Thr	Leu	Phe	Lys	Asn	Trp	
	130					135					140					
ggc	gtg	acg	atc	ccg	acc	ggc	gca	tgt	ccc	ggg	gtg	ggc	gca	ggc	ggg	480
Gly	Val	Thr	Ile	Pro	Thr	Gly	Ala	Cys	Pro	Gly	Val	Gly	Ala	Gly	Gly	
145					150					155				160		
cac	atc	ctc	ggc	ggg	gga	tac	ggc	ccg	ctg	tcg	cgc	cga	ttc	ggt	tcg	528
His	Ile	Leu	Gly	Gly	Gly	Tyr	Gly	Pro	Leu	Ser	Arg	Arg	Phe	Gly	Ser	
			165					170						175		
gtc	gtc	gac	tac	ctt	caa	ggc	gtc	gag	gtc	gtc	gtg	gtc	gac	cag	gcc	576
Val	Val	Asp	Tyr	Leu	Gln	Gly	Val	Glu	Val	Val	Val	Val	Asp	Gln	Ala	
			180					185					190			
ggt	gaa	gtg	cac	atc	gtc	gag	gcc	gac	cgg	aac	tcc	acg	ggc	gcc	ggt	624
Gly	Glu	Val	His	Ile	Val	Glu	Ala	Asp	Arg	Asn	Ser	Thr	Gly	Ala	Gly	
		195					200					205				
cac	gac	ttg	tgg	tgg	gcg	cac	acc	ggt	ggc	ggt	ggc	ggc	aac	ttc	ggg	672
His	Asp	Leu	Trp	Trp	Ala	His	Thr	Gly	Gly	Gly	Gly	Gly	Asn	Phe	Gly	
		210					215					220				
atc	gtc	acc	agg	ttt	tgg	ctc	cga	acg	ccg	gac	gtg	gtc	agc	acc	gac	720
Ile	Val	Thr	Arg	Phe	Trp	Leu	Arg	Thr	Pro	Asp	Val	Val	Ser	Thr	Asp	
225					230					235				240		
gcc	gca	gag	ctc	ctg	cca	cgg	ccg	ccc	gcg	aca	gtg	ctg	ctc	cga	tcg	768

Ala Ala Glu Leu Leu Pro Arg Pro Pro Ala Thr Val Leu Leu Arg Ser	
245	250 255
ttc cac tgg ccg tgg cac gaa ctg aca gag cag tca ttc gcc gtg ctc	816
Phe His Trp Pro Trp His Glu Leu Thr Glu Gln Ser Phe Ala Val Leu	
260	265 270
cta cag aac ttc ggc aat tgg tac gag cag cac agc gcg cct gaa tcc	864
Leu Gln Asn Phe Gly Asn Trp Tyr Glu Gln His Ser Ala Pro Glu Ser	
275	280 285
acg caa ctc ggg ttg ttc agc acg ctc gtc tgc gca cac cgg caa gct	912
Thr Gln Leu Gly Leu Phe Ser Thr Leu Val Cys Ala His Arg Gln Ala	
290	295 300
ggc tac gtc acg ctg aac gtt cac ctg gac ggc acg gat ccg aac gcg	960
Gly Tyr Val Thr Leu Asn Val His Leu Asp Gly Thr Asp Pro Asn Ala	
305	310 315 320
gaa cgc acc ctg gcc gaa cac ctg tcg gcg atc aac gcc cag gtc ggc	1008
Glu Arg Thr Leu Ala Glu His Leu Ser Ala Ile Asn Ala Gln Val Gly	
325	330 335
gtg act cca gcc gaa ggg ctg cgg gaa acc ctg ccg tgg ttg cga tcg	1056
Val Thr Pro Ala Glu Gly Leu Arg Glu Thr Leu Pro Trp Leu Arg Ser	
340	345 350
acc cag gtg gcc ggg gcg atc gcc gaa ggc ggc gaa ccg ggc atg caa	1104
Thr Gln Val Ala Gly Ala Ile Ala Glu Gly Gly Glu Pro Gly Met Gln	
355	360 365
cgg acc aag gtc aaa gcc gcc tac ttg cgc acc ggg ctg tcc gaa gct	1152
Arg Thr Lys Val Lys Ala Ala Tyr Leu Arg Thr Gly Leu Ser Glu Ala	
370	375 380
caa cta gcc acg gtt tac cgg cgg ctg acc gtc tac gga tac gac aac	1200
Gln Leu Ala Thr Val Tyr Arg Arg Leu Thr Val Tyr Gly Tyr Asp Asn	
385	390 395 400
cct gcg gcg gcg ctg ttg ctg ctc ggt tac ggc ggt atg gcg aat gcc	1248
Pro Ala Ala Ala Leu Leu Leu Leu Gly Tyr Gly Gly Met Ala Asn Ala	
405	410 415
gtg gct ccg tcg gcc acc gca ctc gct cag cgc gac tcg gtt ctc aaa	1296
Val Ala Pro Ser Ala Thr Ala Leu Ala Gln Arg Asp Ser Val Leu Lys	
420	425 430
gcg ctg ttc gtc acg aac tgg tcg gag ccc gcc gag gac gag cgg cat	1344

Ala Leu Phe Val Thr Asn Trp Ser Glu Pro Ala Glu Asp Glu Arg His
 435 440 445

ctg acc tgg att cgc ggt ttc tac cgc gag atg tac gcc gaa acc ggc 1392
 Leu Thr Trp Ile Arg Gly Phe Tyr Arg Glu Met Tyr Ala Glu Thr Gly
 450 455 460

gga gtt ccg gtg cca ggt acc cgt gtc gac ggc tcc tac atc aac tac 1440
 Gly Val Pro Val Pro Gly Thr Arg Val Asp Gly Ser Tyr Ile Asn Tyr
 465 470 475 480

ccg gac acc gac ttg gcc gat cca ttg tgg aac acc tcc ggt gtt gcc 1488
 Pro Asp Thr Asp Leu Ala Asp Pro Leu Trp Asn Thr Ser Gly Val Ala
 485 490 495

tgg cac gac ctg tac tac aaa gac aac tac ccg cgg ctg cag cgg gcc 1536
 Trp His Asp Leu Tyr Tyr Lys Asp Asn Tyr Pro Arg Leu Gln Arg Ala
 500 505 510

aaa gcg cgg tgg gat ccg cag aac atc ttc cag cac ggc ctg tcg atc 1584
 Lys Ala Arg Trp Asp Pro Gln Asn Ile Phe Gln His Gly Leu Ser Ile
 515 520 525

aaa ccg ccg gca cgg ctt tca ccc ggt cag cca tga 1620
 Lys Pro Pro Ala Arg Leu Ser Pro Gly Gln Pro
 530 535

<210> 16
 <211> 539
 <212> PRT
 <213> Saccharopolyspora spinosa

<400> 16
 Met Ile Ser Ala Ala Gly Glu Gln Ser Gly Pro Val Arg Lys Gly Gly
 1 5 10 15

Ala Val Pro Glu Phe His Asp Pro Ala Pro Met Asn Arg Arg Thr Pro
 20 25 30

Gly Thr Glu Ile Thr Val Glu Pro Asp Asp Pro Arg Tyr Pro Asp Leu
 35 40 45

Val Val Gly His Asn Pro Arg Phe Thr Gly Lys Pro Glu Arg Ile His
 50 55 60

Ile Ala Ser Ser Ala Glu Asp Val Val His Ala Val Ala Asp Ala Val
 65 70 75 80

Arg Thr Gly Arg Arg Val Gly Val Arg Ser Gly Gly His Cys Phe Glu
85 90 95

Asn Leu Val Ala Asp Pro Ala Ile Arg Val Leu Val Asp Leu Ser Glu
100 105 110

Leu Asn Arg Val Tyr Tyr Asp Ser Thr Arg Gly Ala Phe Ala Ile Glu
115 120 125

Ala Gly Ala Ala Leu Gly Gln Val Tyr Arg Thr Leu Phe Lys Asn Trp
130 135 140

Gly Val Thr Ile Pro Thr Gly Ala Cys Pro Gly Val Gly Ala Gly Gly
145 150 155 160

His Ile Leu Gly Gly Gly Tyr Gly Pro Leu Ser Arg Arg Phe Gly Ser
165 170 175

Val Val Asp Tyr Leu Gln Gly Val Glu Val Val Val Val Asp Gln Ala
180 185 190

Gly Glu Val His Ile Val Glu Ala Asp Arg Asn Ser Thr Gly Ala Gly
195 200 205

His Asp Leu Trp Trp Ala His Thr Gly Gly Gly Gly Gly Asn Phe Gly
210 215 220

Ile Val Thr Arg Phe Trp Leu Arg Thr Pro Asp Val Val Ser Thr Asp
225 230 235 240

Ala Ala Glu Leu Leu Pro Arg Pro Pro Ala Thr Val Leu Leu Arg Ser
245 250 255

Phe His Trp Pro Trp His Glu Leu Thr Glu Gln Ser Phe Ala Val Leu
260 265 270

Leu Gln Asn Phe Gly Asn Trp Tyr Glu Gln His Ser Ala Pro Glu Ser
275 280 285

Thr Gln Leu Gly Leu Phe Ser Thr Leu Val Cys Ala His Arg Gln Ala
290 295 300

Gly Tyr Val Thr Leu Asn Val His Leu Asp Gly Thr Asp Pro Asn Ala
305 310 315 320

Glu Arg Thr Leu Ala Glu His Leu Ser Ala Ile Asn Ala Gln Val Gly
325 330 335

Val Thr Pro Ala Glu Gly Leu Arg Glu Thr Leu Pro Trp Leu Arg Ser
 340 345 350
 Thr Gln Val Ala Gly Ala Ile Ala Glu Gly Gly Glu Pro Gly Met Gln
 355 360 365
 Arg Thr Lys Val Lys Ala Ala Tyr Leu Arg Thr Gly Leu Ser Glu Ala
 370 375 380
 Gln Leu Ala Thr Val Tyr Arg Arg Leu Thr Val Tyr Gly Tyr Asp Asn
 385 390 395 400
 Pro Ala Ala Ala Leu Leu Leu Leu Gly Tyr Gly Gly Met Ala Asn Ala
 405 410 415
 Val Ala Pro Ser Ala Thr Ala Leu Ala Gln Arg Asp Ser Val Leu Lys
 420 425 430
 Ala Leu Phe Val Thr Asn Trp Ser Glu Pro Ala Glu Asp Glu Arg His
 435 440 445
 Leu Thr Trp Ile Arg Gly Phe Tyr Arg Glu Met Tyr Ala Glu Thr Gly
 450 455 460
 Gly Val Pro Val Pro Gly Thr Arg Val Asp Gly Ser Tyr Ile Asn Tyr
 465 470 475 480
 Pro Asp Thr Asp Leu Ala Asp Pro Leu Trp Asn Thr Ser Gly Val Ala
 485 490 495
 Trp His Asp Leu Tyr Tyr Lys Asp Asn Tyr Pro Arg Leu Gln Arg Ala
 500 505 510
 Lys Ala Arg Trp Asp Pro Gln Asn Ile Phe Gln His Gly Leu Ser Ile
 515 520 525
 Lys Pro Pro Ala Arg Leu Ser Pro Gly Gln Pro
 530 535

<210> 17

<211> 1194

<212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1)..(1191)

<223> ORF6; Methyltransferase

<400> 17

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Met Ser Thr Thr His Glu Ile Glu Thr Val Glu Arg Ile Ile Leu Ala

1

5

10

15

gcc gga tcc agt gcg gcg agc ctg gcc gac ctg acc acc gaa ctc gga 96

Ala Gly Ser Ser Ala Ala Ser Leu Ala Asp Leu Thr Thr Glu Leu Gly

20

25

30

ctc gcc agg atc gca ccc gtg ctg atc gac gag atc ctc ttc cgc gcg 144

Leu Ala Arg Ile Ala Pro Val Leu Ile Asp Glu Ile Leu Phe Arg Ala

35

40

45

gaa ccg gcc ccc gac atc gaa cgg acc gag gtc gcg gtc cag atc acc 192

Glu Pro Ala Pro Asp Ile Glu Arg Thr Glu Val Ala Val Gln Ile Thr

50

55

60

cac cga ggc gag acc gtt gac ttc gtc ctg acg cta cag tcc ggt gag 240

His Arg Gly Glu Thr Val Asp Phe Val Leu Thr Leu Gln Ser Gly Glu

65

70

75

80

ctg atc aag gcc gag caa cga ccg gtc gga gac gtc ccg ctg cgg atc 288

Leu Ile Lys Ala Glu Gln Arg Pro Val Gly Asp Val Pro Leu Arg Ile

85

90

95

ggc tac gag ctc acc gat ctc atc gcc gag ttg ttc ggc cca gga gct 336

Gly Tyr Glu Leu Thr Asp Leu Ile Ala Glu Leu Phe Gly Pro Gly Ala

100

105

110

ccc agg gcc gtc ggc gcc cgg agc acc aac ttc ctc cga acc acc aca 384

Pro Arg Ala Val Gly Ala Arg Ser Thr Asn Phe Leu Arg Thr Thr Thr

115

120

125

tcc ggt tcg ata ccc ggt ccg tcg gaa ctg tcc gat ggc ttc cag gcc 432

Ser Gly Ser Ile Pro Gly Pro Ser Glu Leu Ser Asp Gly Phe Gln Ala

130

135

140

atc tcc gca gtg gtc gcc ggc tgc ggg cac cga cgt ccc gac ctc aac 480

Ile Ser Ala Val Val Ala Gly Cys Gly His Arg Arg Pro Asp Leu Asn

145

150

155

160

ttg ctc gcc tcc cac tac cgc acg gac aag tgg ggc ggc ctg cac tgg 528

Leu Leu Ala Ser His Tyr Arg Thr Asp Lys Trp Gly Gly Leu His Trp

165

170

175

ttc acc ccg cta tac gag cga cac ctc ggc gag ttc cgt gat cgc ccg	576
Phe Thr Pro Leu Tyr Glu Arg His Leu Gly Glu Phe Arg Asp Arg Pro	
180 185 190	
gtg cgc atc ctg gag atc ggt gtc ggt ggc tac aac ttc gac ggt ggc	624
Val Arg Ile Leu Glu Ile Gly Val Gly Gly Tyr Asn Phe Asp Gly Gly	
195 200 205	
ggc ggc gaa tcc ctg aag atg tgg aag cgc tac ttc cac cgc ggc ctc	672
Gly Gly Glu Ser Leu Lys Met Trp Lys Arg Tyr Phe His Arg Gly Leu	
210 215 220	
gtg ttc ggg atg gac gtt ttc gac aag tcc ttc ctc gac cag cag agg	720
Val Phe Gly Met Asp Val Phe Asp Lys Ser Phe Leu Asp Gln Gln Arg	
225 230 235 240	
ctc tgc acc gtc cgc gcc gac cag agc aag ccc gag gag ctg gcc gcc	768
Leu Cys Thr Val Arg Ala Asp Gln Ser Lys Pro Glu Glu Leu Ala Ala	
245 250 255	
gtt gac gac aag tac gga ccg ttc gac atc atc atc gac gat ggc agc	816
Val Asp Asp Lys Tyr Gly Pro Phe Asp Ile Ile Ile Asp Asp Gly Ser	
260 265 270	
cac atc aac gga cac gtg cgc aca tcc ctg gaa acg ctg ttc ccc ccg	864
His Ile Asn Gly His Val Arg Thr Ser Leu Glu Thr Leu Phe Pro Arg	
275 280 285	
ttg cgc agc ggt ggc gta tac gtg atc gag gat ctg tgg acg acc tat	912
Leu Arg Ser Gly Gly Val Tyr Val Ile Glu Asp Leu Trp Thr Thr Tyr	
290 295 300	
gct ccc gga ttc ggc ggg cag gcg cag tgc ccg gcc gca ccc ggc acc	960
Ala Pro Gly Phe Gly Gly Gln Ala Gln Cys Pro Ala Ala Pro Gly Thr	
305 310 315 320	
acg gtc agc ctg ctc aag aac ctg ttg gaa ggc gtt cag cac gag gag	1008
Thr Val Ser Leu Leu Lys Asn Leu Leu Glu Gly Val Gln His Glu Glu	
325 330 335	
cag ccg cat gcg ggc tcg tac gag ccg agc tac ctg gaa cgc aat ttg	1056
Gln Pro His Ala Gly Ser Tyr Glu Pro Ser Tyr Leu Glu Arg Asn Leu	
340 345 350	
gtc ggc ctc cac acc tac cac aac atc gcg ttc ctg gag aaa ggc gtc	1104
Val Gly Leu His Thr Tyr His Asn Ile Ala Phe Leu Glu Lys Gly Val	
355 360 365	

aac gcc gaa ggc ggc gtt cct gct tgg gtg cca agg agt ctg gac gac 1152
 Asn Ala Glu Gly Gly Val Pro Ala Trp Val Pro Arg Ser Leu Asp Asp
 370 375 380

ata ttg cac ctg gcc gac gtg aac agc gcg gag gac gag tga 1194
 Ile Leu His Leu Ala Asp Val Asn Ser Ala Glu Asp Glu
 385 390 395

<210> 18

<211> 397

<212> PRT

<213> Saccharopolyspora spinosa

<400> 18

Met Ser Thr Thr His Glu Ile Glu Thr Val Glu Arg Ile Ile Leu Ala
 1 5 10 15

Ala Gly Ser Ser Ala Ala Ser Leu Ala Asp Leu Thr Thr Glu Leu Gly
 20 25 30

Leu Ala Arg Ile Ala Pro Val Leu Ile Asp Glu Ile Leu Phe Arg Ala
 35 40 45

Glu Pro Ala Pro Asp Ile Glu Arg Thr Glu Val Ala Val Gln Ile Thr
 50 55 60

His Arg Gly Glu Thr Val Asp Phe Val Leu Thr Leu Gln Ser Gly Glu
 65 70 75 80

Leu Ile Lys Ala Glu Gln Arg Pro Val Gly Asp Val Pro Leu Arg Ile
 85 90 95

Gly Tyr Glu Leu Thr Asp Leu Ile Ala Glu Leu Phe Gly Pro Gly Ala
 100 105 110

Pro Arg Ala Val Gly Ala Arg Ser Thr Asn Phe Leu Arg Thr Thr Thr
 115 120 125

Ser Gly Ser Ile Pro Gly Pro Ser Glu Leu Ser Asp Gly Phe Gln Ala
 130 135 140

Ile Ser Ala Val Val Ala Gly Cys Gly His Arg Arg Pro Asp Leu Asn
 145 150 155 160

Leu Leu Ala Ser His Tyr Arg Thr Asp Lys Trp Gly Gly Leu His Trp
 165 170 175

Phe Thr Pro Leu Tyr Glu Arg His Leu Gly Glu Phe Arg Asp Arg Pro
 180 185 190
 Val Arg Ile Leu Glu Ile Gly Val Gly Gly Tyr Asn Phe Asp Gly Gly
 195 200 205
 Gly Gly Glu Ser Leu Lys Met Trp Lys Arg Tyr Phe His Arg Gly Leu
 210 215 220
 Val Phe Gly Met Asp Val Phe Asp Lys Ser Phe Leu Asp Gln Gln Arg
 225 230 235 240
 Leu Cys Thr Val Arg Ala Asp Gln Ser Lys Pro Glu Glu Leu Ala Ala
 245 250 255
 Val Asp Asp Lys Tyr Gly Pro Phe Asp Ile Ile Ile Asp Asp Gly Ser
 260 265 270
 His Ile Asn Gly His Val Arg Thr Ser Leu Glu Thr Leu Phe Pro Arg
 275 280 285
 Leu Arg Ser Gly Gly Val Tyr Val Ile Glu Asp Leu Trp Thr Thr Tyr
 290 295 300
 Ala Pro Gly Phe Gly Gly Gln Ala Gln Cys Pro Ala Ala Pro Gly Thr
 305 310 315 320
 Thr Val Ser Leu Leu Lys Asn Leu Leu Glu Gly Val Gln His Glu Glu
 325 330 335
 Gln Pro His Ala Gly Ser Tyr Glu Pro Ser Tyr Leu Glu Arg Asn Leu
 340 345 350
 Val Gly Leu His Thr Tyr His Asn Ile Ala Phe Leu Glu Lys Gly Val
 355 360 365
 Asn Ala Glu Gly Gly Val Pro Ala Trp Val Pro Arg Ser Leu Asp Asp
 370 375 380
 Ile Leu His Leu Ala Asp Val Asn Ser Ala Glu Asp Glu
 385 390 395

<210> 19
 <211> 900
 <212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1)..(897)

<223> ORF7; O-Methyltransferase

<400> 19

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gtg aac agc aga ggg gcg aac aca cag gca ttt ccg acc gcg gat cag 48
Val Asn Ser Arg Gly Ala Asn Thr Gln Ala Phe Pro Thr Ala Asp Gln
  1           5           10           15

gtg gag tcc atc ttc gat gcg ttg gcg cac ggg cgt ccc ctg cac cac 96
Val Glu Ser Ile Phe Asp Ala Leu Ala His Gly Arg Pro Leu His His
          20           25           30

ggg tac tgg gcg ggc ggg tat cgg gag gat gcc ggt gcc aca ccg tgg 144
Gly Tyr Trp Ala Gly Gly Tyr Arg Glu Asp Ala Gly Ala Thr Pro Trp
          35           40           45

tcg gat gct gcc gac caa ctg acc gac ctg ttc atc gac aag gcc gcg 192
Ser Asp Ala Ala Asp Gln Leu Thr Asp Leu Phe Ile Asp Lys Ala Ala
          50           55           60

ctc cgt ccc gga gcg cac ctg ttc gac ctg ggc tgc ggc aat ggg cag 240
Leu Arg Pro Gly Ala His Leu Phe Asp Leu Gly Cys Gly Asn Gly Gln
          65           70           75           80

ccc gta gtc cgt gcg gca tgc gcc agc ggc gtt cga gtc acc gga atc 288
Pro Val Val Arg Ala Ala Cys Ala Ser Gly Val Arg Val Thr Gly Ile
          85           90           95

acc gtg aac gcc cag cat ctc gcc gcc gcc acc agg ctc gcc aac gag 336
Thr Val Asn Ala Gln His Leu Ala Ala Ala Thr Arg Leu Ala Asn Glu
          100          105          110

acc gga ctg gcc ggc agt ctt gag ttc gat cta gtc gac ggc gcc cag 384
Thr Gly Leu Ala Gly Ser Leu Glu Phe Asp Leu Val Asp Gly Ala Gln
          115          120          125

ctg ccc tac ccg gac ggt ttc ttt cag gcc gca tgg gcg atg cag tcc 432
Leu Pro Tyr Pro Asp Gly Phe Phe Gln Ala Ala Trp Ala Met Gln Ser
          130          135          140

gtc gtg cag atc gtg gac cag gcc gcc gcg atc cgc gag gtc cac cga 480
Val Val Gln Ile Val Asp Gln Ala Ala Ala Ile Arg Glu Val His Arg
          145          150          155          160

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atc ctg gaa ccc ggc ggc cgg ttc gtc ctc gga gac atc atc act cgg 528
 Ile Leu Glu Pro Gly Gly Arg Phe Val Leu Gly Asp Ile Ile Thr Arg
 165 170 175

gtt cga ctc ccg gaa gag tac gcg gcg gtt tgg acg ggc acg acc gcc 576
 Val Arg Leu Pro Glu Glu Tyr Ala Ala Val Trp Thr Gly Thr Thr Ala
 180 185 190

cat acc ttg aac agc ttc acg gcg ctg gtc agc gaa gcc ggg ttc gag 624
 His Thr Leu Asn Ser Phe Thr Ala Leu Val Ser Glu Ala Gly Phe Glu
 195 200 205

att ctc gaa gtc acc gac ctc acg gca cag acc agg tgc atg gtc tcc 672
 Ile Leu Glu Val Thr Asp Leu Thr Ala Gln Thr Arg Cys Met Val Ser
 210 215 220

tgg tac gtc gac gag ttg ctc cgg aaa ctc gat gag ctc gcc ggc gtc 720
 Trp Tyr Val Asp Glu Leu Leu Arg Lys Leu Asp Glu Leu Ala Gly Val
 225 230 235 240

gag cct gcg gct gtc ggc acc tac cag caa cgc tac ttg gga gac atc 768
 Glu Pro Ala Ala Val Gly Thr Tyr Gln Gln Arg Tyr Leu Gly Asp Ile
 245 250 255

gcg gcg aag cac gga ccg gga cca gca cag ctg atc gcc gcg gtt gcg 816
 Ala Ala Lys His Gly Pro Gly Pro Ala Gln Leu Ile Ala Ala Val Ala
 260 265 270

gaa tac cgg aaa cat ccg gat tac gcc aga aac gag gaa agc atg ggt 864
 Glu Tyr Arg Lys His Pro Asp Tyr Ala Arg Asn Glu Glu Ser Met Gly
 275 280 285

ttc atg ctc ctg cag gct cga aag aag cag tcc tga 900
 Phe Met Leu Leu Gln Ala Arg Lys Lys Gln Ser
 290 295

<210> 20

<211> 299

<212> PRT

<213> Saccharopolyspora spinosa

<400> 20

Val Asn Ser Arg Gly Ala Asn Thr Gln Ala Phe Pro Thr Ala Asp Gln
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Val Glu Ser Ile Phe Asp Ala Leu Ala His Gly Arg Pro Leu His His
 20 25 30

Gly Tyr Trp Ala Gly Gly Tyr Arg Glu Asp Ala Gly Ala Thr Pro Trp
 35 40 45
 Ser Asp Ala Ala Asp Gln Leu Thr Asp Leu Phe Ile Asp Lys Ala Ala
 50 55 60
 Leu Arg Pro Gly Ala His Leu Phe Asp Leu Gly Cys Gly Asn Gly Gln
 65 70 75 80
 Pro Val Val Arg Ala Ala Cys Ala Ser Gly Val Arg Val Thr Gly Ile
 85 90 95
 Thr Val Asn Ala Gln His Leu Ala Ala Thr Arg Leu Ala Asn Glu
 100 105 110
 Thr Gly Leu Ala Gly Ser Leu Glu Phe Asp Leu Val Asp Gly Ala Gln
 115 120 125
 Leu Pro Tyr Pro Asp Gly Phe Phe Gln Ala Ala Trp Ala Met Gln Ser
 130 135 140
 Val Val Gln Ile Val Asp Gln Ala Ala Ala Ile Arg Glu Val His Arg
 145 150 155 160
 Ile Leu Glu Pro Gly Gly Arg Phe Val Leu Gly Asp Ile Ile Thr Arg
 165 170 175
 Val Arg Leu Pro Glu Glu Tyr Ala Ala Val Trp Thr Gly Thr Thr Ala
 180 185 190
 His Thr Leu Asn Ser Phe Thr Ala Leu Val Ser Glu Ala Gly Phe Glu
 195 200 205
 Ile Leu Glu Val Thr Asp Leu Thr Ala Gln Thr Arg Cys Met Val Ser
 210 215 220
 Trp Tyr Val Asp Glu Leu Leu Arg Lys Leu Asp Glu Leu Ala Gly Val
 225 230 235 240
 Glu Pro Ala Ala Val Gly Thr Tyr Gln Gln Arg Tyr Leu Gly Asp Ile
 245 250 255
 Ala Ala Lys His Gly Pro Gly Pro Ala Gln Leu Ile Ala Ala Val Ala
 260 265 270
 Glu Tyr Arg Lys His Pro Asp Tyr Ala Arg Asn Glu Glu Ser Met Gly
 275 280 285

Phe Met Leu Leu Gln Ala Arg Lys Lys Gln Ser
290 295

<210> 21

<211> 1167

<212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1)..(1164)

<223> ORF8; Cyclisierungsenzym

<400> 21

atg gcc tcc gag cac gcc agc ctg gtc ggc gac gat ctg cgg gca ccc 48
Met Ala Ser Glu His Ala Ser Leu Val Gly Asp Asp Leu Arg Ala Pro
1 5 10 15

gcg gat gat ccc ttc tac cga ccg ccg acg ccg cta ccg ccg ggt gtc 96
Ala Asp Asp Pro Phe Tyr Arg Pro Pro Thr Pro Leu Pro Pro Gly Val
20 25 30

ccg ggc acg ctc ctc agg gcc cgg ccc gtc tcg gca ctg cgc ggc acg 144
Pro Gly Thr Leu Leu Arg Ala Arg Pro Val Ser Ala Leu Arg Gly Thr
35 40 45

ggc gaa ccc gtc gca gcc aag gcc tgg caa atc ctc tac cgg tcc aac 192
Gly Glu Pro Val Ala Ala Lys Ala Trp Gln Ile Leu Tyr Arg Ser Asn
50 55 60

tcc gcc ctt ggc atg ccg aac gcc gtc tcc ggc acc gtt ctg gtg ccg 240
Ser Ala Leu Gly Met Pro Asn Ala Val Ser Gly Thr Val Leu Val Pro
65 70 75 80

aac atc ccg tgg ccg cgc gaa gat cgc ccc atc atc act ttc gca gtg 288
Asn Ile Pro Trp Pro Arg Glu Asp Arg Pro Ile Ile Thr Phe Ala Val
85 90 95

ggc acc cac ggc ctc ggt agc caa gtt gcc ccg tcg tac ctg ctt cga 336
Gly Thr His Gly Leu Gly Ser Gln Val Ala Pro Ser Tyr Leu Leu Arg
100 105 110

acc gga acc gag ccg gag acc gag ctg atc gcc gtg gcc ctc gac cgc 384
Thr Gly Thr Glu Pro Glu Thr Glu Leu Ile Ala Val Ala Leu Asp Arg
115 120 125

ggg tgg gcc gtg gtc atc acc gac tac gaa ggc ctc ggt act cct gga 432
 Gly Trp Ala Val Val Ile Thr Asp Tyr Glu Gly Leu Gly Thr Pro Gly
 130 135 140

acc cac acc tac acc gtc ggc agg gcg cag gga cac gcc atg ctc gat 480
 Thr His Thr Tyr Thr Val Gly Arg Ala Gln Gly His Ala Met Leu Asp
 145 150 155 160

gcc gcc cgc gct gcg caa cgg cta ccg ggc tcc ggc ctg acg acc gac 528
 Ala Ala Arg Ala Ala Gln Arg Leu Pro Gly Ser Gly Leu Thr Thr Asp
 165 170 175

tgc ccg gtc ggc atc tgg ggc tat gcg cag ggt ggg caa gcg tcg gcc 576
 Cys Pro Val Gly Ile Trp Gly Tyr Ala Gln Gly Gly Gln Ala Ser Ala
 180 185 190

ttc gcc ggc gaa ctg cac ccc acc tac gca cct gaa ctg cga atc cgc 624
 Phe Ala Gly Glu Leu His Pro Thr Tyr Ala Pro Glu Leu Arg Ile Arg
 195 200 205

gct gcg gcc gca ggt gcg gtg ccg atc gat ctg ctg gac atc atc cac 672
 Ala Ala Ala Ala Gly Ala Val Pro Ile Asp Leu Leu Asp Ile Ile His
 210 215 220

cga aat gac ggg gtg ttc acc ggg ccg gtg ctg gcc ggc ctg gtc ggg 720
 Arg Asn Asp Gly Val Phe Thr Gly Pro Val Leu Ala Gly Leu Val Gly
 225 230 235 240

cat gcc gct gcc tac ccc gat ctg cca ttc gac gag ctt ctc acc gaa 768
 His Ala Ala Ala Tyr Pro Asp Leu Pro Phe Asp Glu Leu Leu Thr Glu
 245 250 255

gcg ggt cgt acc gcc gtt gat caa gtg cgc gag ctc ggt gca ccg gag 816
 Ala Gly Arg Thr Ala Val Asp Gln Val Arg Glu Leu Gly Ala Pro Glu
 260 265 270

ctc gtc acc cgc ttc ctc ggc cgc gag ctg agc gac ttc ctc gac act 864
 Leu Val Thr Arg Phe Leu Gly Arg Glu Leu Ser Asp Phe Leu Asp Thr
 275 280 285

tcc ggc ctt ttc gag caa cct cga tgg cgc gca cga ctg gcc gaa agc 912
 Ser Gly Leu Phe Glu Gln Pro Arg Trp Arg Ala Arg Leu Ala Glu Ser
 290 295 300

gtc gca ggt agg aac ggt ggc ccg gtg gtc ccc acg ctc gtc tac cac 960
 Val Ala Gly Arg Asn Gly Gly Pro Val Val Pro Thr Leu Val Tyr His
 305 310 315 320

agc acg gac gac gag atc gtt ccg ttc gca ttc ggc gag cga ctc cgg 1008
 Ser Thr Asp Asp Glu Ile Val Pro Phe Ala Phe Gly Glu Arg Leu Arg
 325 330 335

gac agc tac cgc gcg gcg ggt acg cca gtg cgg tgg cat ccg ctc tcc 1056
 Asp Ser Tyr Arg Ala Ala Gly Thr Pro Val Arg Trp His Pro Leu Ser
 340 345 350

gga ttg gct cac ttt ccc gcc gcc ctg gcc agc tcg cga gtg gtc gtc 1104
 Gly Leu Ala His Phe Pro Ala Ala Leu Ala Ser Ser Arg Val Val Val
 355 360 365

tcg tgg ttc gac gag cac ttc tcc gag ccg tcc gcg atc agc ggt ccg 1152
 Ser Trp Phe Asp Glu His Phe Ser Glu Pro Ser Ala Ile Ser Gly Pro
 370 375 380

cga gat gcc agg tga 1167
 Arg Asp Ala Arg
 385

<210> 22

<211> 388

<212> PRT

<213> Saccharopolyspora spinosa

<400> 22

Met Ala Ser Glu His Ala Ser Leu Val Gly Asp Asp Leu Arg Ala Pro
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Ala Asp Asp Pro Phe Tyr Arg Pro Pro Thr Pro Leu Pro Pro Gly Val
 20 25 30

Pro Gly Thr Leu Leu Arg Ala Arg Pro Val Ser Ala Leu Arg Gly Thr
 35 40 45

Gly Glu Pro Val Ala Ala Lys Ala Trp Gln Ile Leu Tyr Arg Ser Asn
 50 55 60

Ser Ala Leu Gly Met Pro Asn Ala Val Ser Gly Thr Val Leu Val Pro
 65 70 75 80

Asn Ile Pro Trp Pro Arg Glu Asp Arg Pro Ile Ile Thr Phe Ala Val
 85 90 95

Gly Thr His Gly Leu Gly Ser Gln Val Ala Pro Ser Tyr Leu Leu Arg
 100 105 110

Thr Gly Thr Glu Pro Glu Thr Glu Leu Ile Ala Val Ala Leu Asp Arg
 115 120 125

Gly Trp Ala Val Val Ile Thr Asp Tyr Glu Gly Leu Gly Thr Pro Gly
 130 135 140

Thr His Thr Tyr Thr Val Gly Arg Ala Gln Gly His Ala Met Leu Asp
 145 150 155 160

Ala Ala Arg Ala Ala Gln Arg Leu Pro Gly Ser Gly Leu Thr Thr Asp
 165 170 175

Cys Pro Val Gly Ile Trp Gly Tyr Ala Gln Gly Gly Gln Ala Ser Ala
 180 185 190

Phe Ala Gly Glu Leu His Pro Thr Tyr Ala Pro Glu Leu Arg Ile Arg
 195 200 205

Ala Ala Ala Ala Gly Ala Val Pro Ile Asp Leu Leu Asp Ile Ile His
 210 215 220

Arg Asn Asp Gly Val Phe Thr Gly Pro Val Leu Ala Gly Leu Val Gly
 225 230 235 240

His Ala Ala Ala Tyr Pro Asp Leu Pro Phe Asp Glu Leu Leu Thr Glu
 245 250 255

Ala Gly Arg Thr Ala Val Asp Gln Val Arg Glu Leu Gly Ala Pro Glu
 260 265 270

Leu Val Thr Arg Phe Leu Gly Arg Glu Leu Ser Asp Phe Leu Asp Thr
 275 280 285

Ser Gly Leu Phe Glu Gln Pro Arg Trp Arg Ala Arg Leu Ala Glu Ser
 290 295 300

Val Ala Gly Arg Asn Gly Gly Pro Val Val Pro Thr Leu Val Tyr His
 305 310 315 320

Ser Thr Asp Asp Glu Ile Val Pro Phe Ala Phe Gly Glu Arg Leu Arg
 325 330 335

Asp Ser Tyr Arg Ala Ala Gly Thr Pro Val Arg Trp His Pro Leu Ser
 340 345 350

Gly Leu Ala His Phe Pro Ala Ala Leu Ala Ser Ser Arg Val Val Val
 355 360 365

Ser Trp Phe Asp Glu His Phe Ser Glu Pro Ser Ala Ile Ser Gly Pro
 370 375 380

Arg Asp Ala Arg
 385

<210> 23
 <211> 1011
 <212> DNA
 <213> Saccharopolyspora spinosa

<220>
 <221> CDS
 <222> (1)..(1008)
 <223> ORF9; 2,3-Reduktase

<400> 23
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 Met Thr Ser Ser Met Arg Lys Pro Val Arg Ile Gly Val Leu Gly Cys
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 gct tcc ttc gcg tgg cga cgg atg ctg ccc gcg atg tgc gac gtg gcc 96
 Ala Ser Phe Ala Trp Arg Arg Met Leu Pro Ala Met Cys Asp Val Ala
 20 25 30
 gaa aca gag gtg gtg gcg gtg gcg agc cgt gat ccg gcg aaa gcc gaa 144
 Glu Thr Glu Val Val Ala Val Ala Ser Arg Asp Pro Ala Lys Ala Glu
 35 40 45
 cgg ttc gca gcg cga ttc gaa tgc gag gcg gtg ctg ggt tac cag cgg 192
 Arg Phe Ala Ala Arg Phe Glu Cys Glu Ala Val Leu Gly Tyr Gln Arg
 50 55 60
 ctc ctg gag cgg ccg gac atc gat gcc gtc tac gtg ccg ttg ccg cct 240
 Leu Leu Glu Arg Pro Asp Ile Asp Ala Val Tyr Val Pro Leu Pro Pro
 65 70 75 80
 ggc atg cat gca gag tgg atc ggc aag gcg ctt gag gca gac aaa cac 288
 Gly Met His Ala Glu Trp Ile Gly Lys Ala Leu Glu Ala Asp Lys His
 85 90 95
 gtg ctt gcg gag aaa ccg ctg acg acg acg gcg tcc gac acc gct cgc 336
 Val Leu Ala Glu Lys Pro Leu Thr Thr Thr Ala Ser Asp Thr Ala Arg
 100 105 110

ctg gtc ggg ctg gcc agg agg aag aac ctg ctg ctg cgg gag aat tac	384
Leu Val Gly Leu Ala Arg Arg Lys Asn Leu Leu Leu Arg Glu Asn Tyr	
115 120 125	
ctg ttc ctc cac cac ggc cgg cac gac gtg gtc cgc gac ctg ctg caa	432
Leu Phe Leu His His Gly Arg His Asp Val Val Arg Asp Leu Leu Gln	
130 135 140	
tcc ggg gag atc ggt gag ctc cgg gag ttc acc gcc gtg ttc gga att	480
Ser Gly Glu Ile Gly Glu Leu Arg Glu Phe Thr Ala Val Phe Gly Ile	
145 150 155 160	
ccg ccg ctt ccc gac acg gac atc cgc tat cgc acc gaa ctc ggt ggc	528
Pro Pro Leu Pro Asp Thr Asp Ile Arg Tyr Arg Thr Glu Leu Gly Gly	
165 170 175	
gga gcg ttg ctg gac atc ggt gtc tat ccc gcc cgt gcc gct cgg cac	576
Gly Ala Leu Leu Asp Ile Gly Val Tyr Pro Ala Arg Ala Ala Arg His	
180 185 190	
ttt ctc ctc ggt ccg ctc acg gtt ctc ggc gca agc tcg cac gag gcc	624
Phe Leu Leu Gly Pro Leu Thr Val Leu Gly Ala Ser Ser His Glu Ala	
195 200 205	
cag gag tcg ggc gtc gac ttg tcg ggc agc gtg ctg ctc caa tcg gaa	672
Gln Glu Ser Gly Val Asp Leu Ser Gly Ser Val Leu Leu Gln Ser Glu	
210 215 220	
ggt ggc acc gtt gcc cac ctc gga tac ggt ttc gtg cac cac tac cgc	720
Gly Gly Thr Val Ala His Leu Gly Tyr Gly Phe Val His His Tyr Arg	
225 230 235 240	
agc gcg tac gag ctg tgg ggg agt cgt ggg cga atc gtc gtc gac cgg	768
Ser Ala Tyr Glu Leu Trp Gly Ser Arg Gly Arg Ile Val Val Asp Arg	
245 250 255	
gcg ttc acg ccg ccc gcc gag tgg cag gcc gtg atc cga atc gag cgg	816
Ala Phe Thr Pro Pro Ala Glu Trp Gln Ala Val Ile Arg Ile Glu Arg	
260 265 270	
aag ggc gtt gtc gac gag ttg tcc ttg cca gcg gaa gat cag gtt cgc	864
Lys Gly Val Val Asp Glu Leu Ser Leu Pro Ala Glu Asp Gln Val Arg	
275 280 285	
aag gcg gtc acc gcc ttc gca cgc gac atc aga gca ggg aca ggc gtg	912
Lys Ala Val Thr Ala Phe Ala Arg Asp Ile Arg Ala Gly Thr Gly Val	
290 295 300	

gac gac cct gcg gtg gcc gga gat tcg ggc gaa tcg atg atc cag cag 960
 Asp Asp Pro Ala Val Ala Gly Asp Ser Gly Glu Ser Met Ile Gln Gln
 305 310 315 320

gcc gcg ctg gtg gag gcg atc ggt cag gcc cgt cgg tgc ggg tcc aca 1008
 Ala Ala Leu Val Glu Ala Ile Gly Gln Ala Arg Arg Cys Gly Ser Thr
 325 330 335

tag 1011

<210> 24

<211> 336

<212> PRT

<213> Saccharopolyspora spinosa

<400> 24

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Ala Ser Phe Ala Trp Arg Arg Met Leu Pro Ala Met Cys Asp Val Ala
 20 25 30

Glu Thr Glu Val Val Ala Val Ala Ser Arg Asp Pro Ala Lys Ala Glu
 35 40 45

Arg Phe Ala Ala Arg Phe Glu Cys Glu Ala Val Leu Gly Tyr Gln Arg
 50 55 60

Leu Leu Glu Arg Pro Asp Ile Asp Ala Val Tyr Val Pro Leu Pro Pro
 65 70 75 80

Gly Met His Ala Glu Trp Ile Gly Lys Ala Leu Glu Ala Asp Lys His
 85 90 95

Val Leu Ala Glu Lys Pro Leu Thr Thr Thr Ala Ser Asp Thr Ala Arg
 100 105 110

Leu Val Gly Leu Ala Arg Arg Lys Asn Leu Leu Leu Arg Glu Asn Tyr
 115 120 125

Leu Phe Leu His His Gly Arg His Asp Val Val Arg Asp Leu Leu Gln
 130 135 140

Ser Gly Glu Ile Gly Glu Leu Arg Glu Phe Thr Ala Val Phe Gly Ile
 145 150 155 160

Pro Pro Leu Pro Asp Thr Asp Ile Arg Tyr Arg Thr Glu Leu Gly Gly

	165	170	175
Gly Ala Leu Leu Asp Ile Gly Val Tyr Pro Ala Arg Ala Ala Arg His			
	180	185	190
Phe Leu Leu Gly Pro Leu Thr Val Leu Gly Ala Ser Ser His Glu Ala			
	195	200	205
Gln Glu Ser Gly Val Asp Leu Ser Gly Ser Val Leu Leu Gln Ser Glu			
	210	215	220
Gly Gly Thr Val Ala His Leu Gly Tyr Gly Phe Val His His Tyr Arg			
	225	230	235 240
Ser Ala Tyr Glu Leu Trp Gly Ser Arg Gly Arg Ile Val Val Asp Arg			
	245	250	255
Ala Phe Thr Pro Pro Ala Glu Trp Gln Ala Val Ile Arg Ile Glu Arg			
	260	265	270
Lys Gly Val Val Asp Glu Leu Ser Leu Pro Ala Glu Asp Gln Val Arg			
	275	280	285
Lys Ala Val Thr Ala Phe Ala Arg Asp Ile Arg Ala Gly Thr Gly Val			
	290	295	300
Asp Asp Pro Ala Val Ala Gly Asp Ser Gly Glu Ser Met Ile Gln Gln			
	305	310	315 320
Ala Ala Leu Val Glu Ala Ile Gly Gln Ala Arg Arg Cys Gly Ser Thr			
	325	330	335

<210> 25

<211> 1461

<212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1)..(1458)

<223> ORF10; 2,3-Dehydratase

<400> 25

atg agc agt tct gtc gaa gct gag gca agt gct gct gcg ccg ctc ggc 48
 Met Ser Ser Ser Val Glu Ala Glu Ala Ser Ala Ala Ala Pro Leu Gly

1

5

10

15

agc aac aac acg cgg cgg ttc gtc gac tct gcg ctg agc gct tgc aat	96
Ser Asn Asn Thr Arg Arg Phe Val Asp Ser Ala Leu Ser Ala Cys Asn	
20 25 30	
ggc atg att ccg acc acg gag ttc cac tgc tgg ctc gcc gat cgg ctg	144
Gly Met Ile Pro Thr Thr Glu Phe His Cys Trp Leu Ala Asp Arg Leu	
35 40 45	
ggc gag aac agc ttc gag acc aat cgc atc ccg ttc gac cgc ctg tcg	192
Gly Glu Asn Ser Phe Glu Thr Asn Arg Ile Pro Phe Asp Arg Leu Ser	
50 55 60	
aaa tgg aaa ttc gat gcc agc acg gag aac ctg gtt cat gcc gac ggt	240
Lys Trp Lys Phe Asp Ala Ser Thr Glu Asn Leu Val His Ala Asp Gly	
65 70 75 80	
agg ttc ttc acg gta gaa ggc ctg cag gtc gag acc aac tat ggc gcg	288
Arg Phe Phe Thr Val Glu Gly Leu Gln Val Glu Thr Asn Tyr Gly Ala	
85 90 95	
gca ccc agc tgg cac cag ccg atc atc aac cag gct gaa gta ggt atc	336
Ala Pro Ser Trp His Gln Pro Ile Ile Asn Gln Ala Glu Val Gly Ile	
100 105 110	
ctc ggc att ctc gtc aag gag atc gac ggc gtg ctg cac tgc ctc atg	384
Leu Gly Ile Leu Val Lys Glu Ile Asp Gly Val Leu His Cys Leu Met	
115 120 125	
tca gca aag atg gaa ccg ggc aac gtc aac gtc ctg cag ctc tcg ccg	432
Ser Ala Lys Met Glu Pro Gly Asn Val Asn Val Leu Gln Leu Ser Pro	
130 135 140	
acg gtt cag gca act cgg agc aac tac acg cag gca cac cgt ggc agc	480
Thr Val Gln Ala Thr Arg Ser Asn Tyr Thr Gln Ala His Arg Gly Ser	
145 150 155 160	
gtt ccg ccc tat gtg gac tac ttc ctc ggg cgg ggc cgc ggc cgc gtg	528
Val Pro Pro Tyr Val Asp Tyr Phe Leu Gly Arg Gly Arg Gly Arg Val	
165 170 175	
ctg gta gac gtg ctc cag tct gaa cag ggg tcc tgg ttc tac cgg aag	576
Leu Val Asp Val Leu Gln Ser Glu Gln Gly Ser Trp Phe Tyr Arg Lys	
180 185 190	
cgc aac cgg aac atg gtg gtg gaa gtc cag gag gaa gtg cca gtc ctg	624
Arg Asn Arg Asn Met Val Val Glu Val Gln Glu Glu Val Pro Val Leu	
195 200 205	

cca gac ttc tgc tgg ttg acg ctc ggc cag gtg ctg gct ctc ctt cgt 672
 Pro Asp Phe Cys Trp Leu Thr Leu Gly Gln Val Leu Ala Leu Leu Arg
 210 215 220

cag gac aac atc gtc aac atg gac acc cgg acg gtg ctg tct tgc atc 720
 Gln Asp Asn Ile Val Asn Met Asp Thr Arg Thr Val Leu Ser Cys Ile
 225 230 235 240

ccg ttc cac gat tcc gcc acc gga ccc gaa cta gcc gcc tcg gag gag 768
 Pro Phe His Asp Ser Ala Thr Gly Pro Glu Leu Ala Ala Ser Glu Glu
 245 250 255

ccc ttc cga cag gcg gtg gcc agg tcg ctc tcg cac ggc atc gat tcg 816
 Pro Phe Arg Gln Ala Val Ala Arg Ser Leu Ser His Gly Ile Asp Ser
 260 265 270

tcg agt atc tcc gag gcg gtc ggt tgg ttc gag gaa gcc aag gcc cgc 864
 Ser Ser Ile Ser Glu Ala Val Gly Trp Phe Glu Glu Ala Lys Ala Arg
 275 280 285

tac cgc ttg cgg gca acg cgc gtt ccg ctg agc agg gtc gac aag tgg 912
 Tyr Arg Leu Arg Ala Thr Arg Val Pro Leu Ser Arg Val Asp Lys Trp
 290 295 300

tat cgc acc gat acc gag atc gcc cac cag gac ggc aag tac ttc gcg 960
 Tyr Arg Thr Asp Thr Glu Ile Ala His Gln Asp Gly Lys Tyr Phe Ala
 305 310 315 320

gtg atc gcg gtg tcg gtg tcc gcg acc aat cgt gag gtc gcc agc tgg 1008
 Val Ile Ala Val Ser Val Ser Ala Thr Asn Arg Glu Val Ala Ser Trp
 325 330 335

acg cag ccg atg atc gaa ccg cga gaa caa ggt gag atc gca ctg ttg 1056
 Thr Gln Pro Met Ile Glu Pro Arg Glu Gln Gly Glu Ile Ala Leu Leu
 340 345 350

gtc aag ccg atc ggc gga gtg ctg cac ggt ttg gtc cac gct cgg gtg 1104
 Val Lys Arg Ile Gly Gly Val Leu His Gly Leu Val His Ala Arg Val
 355 360 365

gag gct ggg tat aag tgg act gcg gaa atc gct ccc acg gtc cag tgc 1152
 Glu Ala Gly Tyr Lys Trp Thr Ala Glu Ile Ala Pro Thr Val Gln Cys
 370 375 380

agt gtg gcc aac tac caa agc acc ccg tcg aac gac tgg ccg ccg ttc 1200
 Ser Val Ala Asn Tyr Gln Ser Thr Pro Ser Asn Asp Trp Pro Pro Phe
 385 390 395 400

ttg gac gac gtg ctc acc gcc gat ccc gaa acc gtg cgg tac gaa tcg 1248
 Leu Asp Asp Val Leu Thr Ala Asp Pro Glu Thr Val Arg Tyr Glu Ser
 405 410 415

atc ctg tcc gaa gaa ggc ggt cgg ttc tac cag gcg cag aac agg tac 1296
 Ile Leu Ser Glu Glu Gly Gly Arg Phe Tyr Gln Ala Gln Asn Arg Tyr
 420 425 430

cgg atc atc gag gtg cat gag gac ttc gcg gca cga cct ccc agc gac 1344
 Arg Ile Ile Glu Val His Glu Asp Phe Ala Ala Arg Pro Pro Ser Asp
 435 440 445

ttc cgg tgg atg act ttg gga cag ttg ggc gag ctg ctc cgg agc acc 1392
 Phe Arg Trp Met Thr Leu Gly Gln Leu Gly Glu Leu Leu Arg Ser Thr
 450 455 460

cac ttc ttg aac atc cag gcg cgc agc ttg gtc gcc tcc ctg cat agc 1440
 His Phe Leu Asn Ile Gln Ala Arg Ser Leu Val Ala Ser Leu His Ser
 465 470 475 480

ttg tgg gcg ttg ggg cga tga 1461
 Leu Trp Ala Leu Gly Arg
 485

<210> 26

<211> 486

<212> PRT

<213> Saccharopolyspora spinosa

<400> 26

Met Ser Ser Ser Val Glu Ala Glu Ala Ser Ala Ala Ala Pro Leu Gly
 1 5 10 15

Ser Asn Asn Thr Arg Arg Phe Val Asp Ser Ala Leu Ser Ala Cys Asn
 20 25 30

Gly Met Ile Pro Thr Thr Glu Phe His Cys Trp Leu Ala Asp Arg Leu
 35 40 45

Gly Glu Asn Ser Phe Glu Thr Asn Arg Ile Pro Phe Asp Arg Leu Ser
 50 55 60

Lys Trp Lys Phe Asp Ala Ser Thr Glu Asn Leu Val His Ala Asp Gly
 65 70 75 80

Arg Phe Phe Thr Val Glu Gly Leu Gln Val Glu Thr Asn Tyr Gly Ala

85	90	95
Ala Pro Ser Trp His Gln Pro Ile Ile Asn Gln Ala Glu Val Gly Ile 100 105 110		
Leu Gly Ile Leu Val Lys Glu Ile Asp Gly Val Leu His Cys Leu Met 115 120 125		
Ser Ala Lys Met Glu Pro Gly Asn Val Asn Val Leu Gln Leu Ser Pro 130 135 140		
Thr Val Gln Ala Thr Arg Ser Asn Tyr Thr Gln Ala His Arg Gly Ser 145 150 155 160		
Val Pro Pro Tyr Val Asp Tyr Phe Leu Gly Arg Gly Arg Gly Arg Val 165 170 175		
Leu Val Asp Val Leu Gln Ser Glu Gln Gly Ser Trp Phe Tyr Arg Lys 180 185 190		
Arg Asn Arg Asn Met Val Val Glu Val Gln Glu Glu Val Pro Val Leu 195 200 205		
Pro Asp Phe Cys Trp Leu Thr Leu Gly Gln Val Leu Ala Leu Leu Arg 210 215 220		
Gln Asp Asn Ile Val Asn Met Asp Thr Arg Thr Val Leu Ser Cys Ile 225 230 235 240		
Pro Phe His Asp Ser Ala Thr Gly Pro Glu Leu Ala Ala Ser Glu Glu 245 250 255		
Pro Phe Arg Gln Ala Val Ala Arg Ser Leu Ser His Gly Ile Asp Ser 260 265 270		
Ser Ser Ile Ser Glu Ala Val Gly Trp Phe Glu Glu Ala Lys Ala Arg 275 280 285		
Tyr Arg Leu Arg Ala Thr Arg Val Pro Leu Ser Arg Val Asp Lys Trp 290 295 300		
Tyr Arg Thr Asp Thr Glu Ile Ala His Gln Asp Gly Lys Tyr Phe Ala 305 310 315 320		
Val Ile Ala Val Ser Val Ser Ala Thr Asn Arg Glu Val Ala Ser Trp 325 330 335		
Thr Gln Pro Met Ile Glu Pro Arg Glu Gln Gly Glu Ile Ala Leu Leu		

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<400> 27
gtg agc aac gtg tgg ccg gaa aca tgg acg ccg ggg ttt ggc agg tgt    48
Val Ser Asn Val Trp Pro Glu Thr Trp Thr Pro Gly Phe Gly Arg Cys
  1              5              10              15

tca tcg ctg ttg cgt cga ctc gga ttc cgc cgt gac cgg gac gat gcc    96
Ser Ser Leu Leu Arg Arg Leu Gly Phe Arg Arg Asp Arg Asp Asp Ala

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20	25	30	
agg cga gtc ccg aag tca gat tct tgt cca gaa tcg tcc aat ggg gtg			144
Arg Arg Val Pro Lys Ser Asp Ser Cys Pro Glu Ser Ser Asn Gly Val			
35	40	45	
ttg atc tcc cca gag gtt tgc gct cca acc gat ttc cga cga gga tcg			192
Leu Ile Ser Pro Glu Val Cys Ala Pro Thr Asp Phe Arg Arg Gly Ser			
50	55	60	
tgg cgc ccg ctg agc aac gac tac cgt gcg gtc gag aca tac cgc tgt			240
Trp Arg Pro Leu Ser Asn Asp Tyr Arg Ala Val Glu Thr Tyr Arg Cys			
65	70	75	80
gcg cca gga gcg aag gtg ggt tgc ccg atc acc gtg ctg gtg gta gat			288
Ala Pro Gly Ala Lys Val Gly Cys Pro Ile Thr Val Leu Val Val Asp			
85	90	95	
gcc gag ccg aag gtc acc ttg gat gag gcg gaa gcc tgg cga gag cac			336
Ala Glu Pro Lys Val Thr Leu Asp Glu Ala Glu Ala Trp Arg Glu His			
100	105	110	
acc gag gcc gtg gcc gac gtc cgt gtc ttc tcc ggc ggg cat ttc ttc			384
Thr Glu Ala Val Ala Asp Val Arg Val Phe Ser Gly Gly His Phe Phe			
115	120	125	
atg acc gaa cgc cag gac gag gtg ctc gcg gtc ctt acg ggc gga tcg			432
Met Thr Glu Arg Gln Asp Glu Val Leu Ala Val Leu Thr Gly Gly Ser			
130	135	140	
ctt cga tgatcctcgc caggccgctg gaccagaccg cgacgccctt gggagccggc			488
Leu Arg			
145			
gtgcacatcg tcacggcagt gagggattgg gcatga			524

<210> 28

<211> 146

<212> PRT

<213> Saccharopolyspora spinosa

<400> 28

Val Ser Asn Val Trp Pro Glu Thr Trp Thr Pro Gly Phe Gly Arg Cys

1

5

10

15

Ser Ser Leu Leu Arg Arg Leu Gly Phe Arg Arg Asp Arg Asp Asp Ala

20

25

30

Arg Arg Val Pro Lys Ser Asp Ser Cys Pro Glu Ser Ser Asn Gly Val
 35 40 45

Leu Ile Ser Pro Glu Val Cys Ala Pro Thr Asp Phe Arg Arg Gly Ser
 50 55 60

Trp Arg Pro Leu Ser Asn Asp Tyr Arg Ala Val Glu Thr Tyr Arg Cys
 65 70 75 80

Ala Pro Gly Ala Lys Val Gly Cys Pro Ile Thr Val Leu Val Val Asp
 85 90 95

Ala Glu Pro Lys Val Thr Leu Asp Glu Ala Glu Ala Trp Arg Glu His
 100 105 110

Thr Glu Ala Val Ala Asp Val Arg Val Phe Ser Gly Gly His Phe Phe
 115 120 125

Met Thr Glu Arg Gln Asp Glu Val Leu Ala Val Leu Thr Gly Gly Ser
 130 135 140

Leu Arg
 145

<210> 29

<211> 1320

<212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1)..(1317)

<223> ORF12; Glycosyltransferase

<400> 29

atg cgt gtc ctg ttc acc ccg ctg ccg gcg agt tcg cac ttc ttc aac 48
 Met Arg Val Leu Phe Thr Pro Leu Pro Ala Ser Ser His Phe Phe Asn
 1 5 10 15

ctg gtg ccg ttg gcg tgg gcg ttg cgt gcc gcg ggg cac gag gtc cgt 96
 Leu Val Pro Leu Ala Trp Ala Leu Arg Ala Ala Gly His Glu Val Arg
 20 25 30

gtc gcc atc tgc ccg aat atg gtg tcg atg gtc acc gga gca gga ctc 144
 Val Ala Ile Cys Pro Asn Met Val Ser Met Val Thr Gly Ala Gly Leu

35	40	45	
acc gcg gtt ccc gtc ggc gac gag ctc gac ctc atc tcc ttg gcg gcc			192
Thr Ala Val Pro Val Gly Asp Glu Leu Asp Leu Ile Ser Leu Ala Ala			
50	55	60	
aag aac gaa ctc gtt ctc ggc agc ggg gtc tcg ttc gac gag aag ggg			240
Lys Asn Glu Leu Val Leu Gly Ser Gly Val Ser Phe Asp Glu Lys Gly			
65	70	75	80
cgg cat ccg gaa ctc ttc gac gag ctg ctg tca atc aac tcc ggc aga			288
Arg His Pro Glu Leu Phe Asp Glu Leu Leu Ser Ile Asn Ser Gly Arg			
85	90	95	
gac acg gac gcc gtg gag caa ctc cac ctt gtg gat gac cga tcg ctg			336
Asp Thr Asp Ala Val Glu Gln Leu His Leu Val Asp Asp Arg Ser Leu			
100	105	110	
gac gat ctc atg ggg ttc gcc gag aaa tgg cag cct gat ctc gtt gtg			384
Asp Asp Leu Met Gly Phe Ala Glu Lys Trp Gln Pro Asp Leu Val Val			
115	120	125	
tgg gac gct atg gtg tgt tcg ggg cca gtt gtg gcg cga gcg ctc ggc			432
Trp Asp Ala Met Val Cys Ser Gly Pro Val Val Ala Arg Ala Leu Gly			
130	135	140	
gca cga cac gtg cgg atg ctc gtc gcc ctc gat gtg tcg ggg tgg ctg			480
Ala Arg His Val Arg Met Leu Val Ala Leu Asp Val Ser Gly Trp Leu			
145	150	155	160
cgg tcc ggt ttc ctc gaa tac cag gaa tcg aag ccg cct gag cag cgc			528
Arg Ser Gly Phe Leu Glu Tyr Gln Glu Ser Lys Pro Pro Glu Gln Arg			
165	170	175	
gtc gac ccg ctc ggg acg tgg ctg gga gcg aag ctc gcc aag ttc gga			576
Val Asp Pro Leu Gly Thr Trp Leu Gly Ala Lys Leu Ala Lys Phe Gly			
180	185	190	
gcc acg ttc gat gaa gag atc gtg acg ggc caa gcg acc ata gat ccg			624
Ala Thr Phe Asp Glu Glu Ile Val Thr Gly Gln Ala Thr Ile Asp Pro			
195	200	205	
att cca tcc tgg atg cgc ctg cct gtg gac ttg gac tac atc tcg atg			672
Ile Pro Ser Trp Met Arg Leu Pro Val Asp Leu Asp Tyr Ile Ser Met			
210	215	220	
cgt ttc gtg ccg tac aac ggt ccg gcg gtg ttg ccg gag tgg ttg cgc			720
Arg Phe Val Pro Tyr Asn Gly Pro Ala Val Leu Pro Glu Trp Leu Arg			

225	230	235	240	
gaa cga ccg acg aag ccg cgc gtc tgc atc acg cgc ggg ctg acc aag				768
Glu Arg Pro Thr Lys Pro Arg Val Cys Ile Thr Arg Gly Leu Thr Lys				
245		250	255	
cgg cgg ctg agc agg gtg acc gaa cag tac ggg gag caa agt gac cag				816
Arg Arg Leu Ser Arg Val Thr Glu Gln Tyr Gly Glu Gln Ser Asp Gln				
260		265	270	
gaa caa gca atg gtg gaa agg ttg ttg cgc ggc gcg gcc agg ctc gac				864
Glu Gln Ala Met Val Glu Arg Leu Leu Arg Gly Ala Ala Arg Leu Asp				
275		280	285	
gtc gag gtg atc gcc acc ttg tct gac gac gaa gta cgg gag atg ggg				912
Val Glu Val Ile Ala Thr Leu Ser Asp Asp Glu Val Arg Glu Met Gly				
290		295	300	
gag ttg ccc tcg aac gtc cgg gtc cac gaa tac gta ccg ctc aac gaa				960
Glu Leu Pro Ser Asn Val Arg Val His Glu Tyr Val Pro Leu Asn Glu				
305		310	315	320
ctg ctg gag tcg tgt tca gtg atc atc cat cat ggc tcg acg acg acg				1008
Leu Leu Glu Ser Cys Ser Val Ile Ile His His Gly Ser Thr Thr Thr				
325		330	335	
cag gaa acc gcc acg gtc aac ggc gta ccg cag ttg att ctc cct ggg				1056
Gln Glu Thr Ala Thr Val Asn Gly Val Pro Gln Leu Ile Leu Pro Gly				
340		345	350	
acc ttc tgg gac gaa tct cgt agg gcg gag ctc cta gcc gat cgg gga				1104
Thr Phe Trp Asp Glu Ser Arg Arg Ala Glu Leu Leu Ala Asp Arg Gly				
355		360	365	
gcc ggt ctg gtc ctc gac ccc gcg acg ttt acc gaa gac gac gtg cga				1152
Ala Gly Leu Val Leu Asp Pro Ala Thr Phe Thr Glu Asp Asp Val Arg				
370		375	380	
ggg cag ctg gcc cgc ctg ctc gac gag ccg tcg ttc gct gcc aac gcg				1200
Gly Gln Leu Ala Arg Leu Leu Asp Glu Pro Ser Phe Ala Ala Asn Ala				
385		390	395	400
gcg ctg atc cgc cgt gaa atc gag gaa agt ccc agc ccg cac gac atc				1248
Ala Leu Ile Arg Arg Glu Ile Glu Glu Ser Pro Ser Pro His Asp Ile				
405		410	415	
gtt cca cgt ctg gaa aag cta gtt gcc gaa cgt gag aac cgc cgc act				1296
Val Pro Arg Leu Glu Lys Leu Val Ala Glu Arg Glu Asn Arg Arg Thr				

420

425

430

ggg cag tct gat ggc cat ccg tga
Gly Gln Ser Asp Gly His Pro

1320

435

<210> 30

<211> 439

<212> PRT

<213> Saccharopolyspora spinosa

<400> 30

Met Arg Val Leu Phe Thr Pro Leu Pro Ala Ser Ser His Phe Phe Asn
1 5 10 15

Leu Val Pro Leu Ala Trp Ala Leu Arg Ala Ala Gly His Glu Val Arg
20 25 30

Val Ala Ile Cys Pro Asn Met Val Ser Met Val Thr Gly Ala Gly Leu
35 40 45

Thr Ala Val Pro Val Gly Asp Glu Leu Asp Leu Ile Ser Leu Ala Ala
50 55 60

Lys Asn Glu Leu Val Leu Gly Ser Gly Val Ser Phe Asp Glu Lys Gly
65 70 75 80

Arg His Pro Glu Leu Phe Asp Glu Leu Leu Ser Ile Asn Ser Gly Arg
85 90 95

Asp Thr Asp Ala Val Glu Gln Leu His Leu Val Asp Asp Arg Ser Leu
100 105 110

Asp Asp Leu Met Gly Phe Ala Glu Lys Trp Gln Pro Asp Leu Val Val
115 120 125

Trp Asp Ala Met Val Cys Ser Gly Pro Val Val Ala Arg Ala Leu Gly
130 135 140

Ala Arg His Val Arg Met Leu Val Ala Leu Asp Val Ser Gly Trp Leu
145 150 155 160

Arg Ser Gly Phe Leu Glu Tyr Gln Glu Ser Lys Pro Pro Glu Gln Arg
165 170 175

Val Asp Pro Leu Gly Thr Trp Leu Gly Ala Lys Leu Ala Lys Phe Gly
180 185 190

Ala Thr Phe Asp Glu Glu Ile Val Thr Gly Gln Ala Thr Ile Asp Pro
 195 200 205

Ile Pro Ser Trp Met Arg Leu Pro Val Asp Leu Asp Tyr Ile Ser Met
 210 215 220

Arg Phe Val Pro Tyr Asn Gly Pro Ala Val Leu Pro Glu Trp Leu Arg
 225 230 235 240

Glu Arg Pro Thr Lys Pro Arg Val Cys Ile Thr Arg Gly Leu Thr Lys
 245 250 255

Arg Arg Leu Ser Arg Val Thr Glu Gln Tyr Gly Glu Gln Ser Asp Gln
 260 265 270

Glu Gln Ala Met Val Glu Arg Leu Leu Arg Gly Ala Ala Arg Leu Asp
 275 280 285

Val Glu Val Ile Ala Thr Leu Ser Asp Asp Glu Val Arg Glu Met Gly
 290 295 300

Glu Leu Pro Ser Asn Val Arg Val His Glu Tyr Val Pro Leu Asn Glu
 305 310 315 320

Leu Leu Glu Ser Cys Ser Val Ile Ile His His Gly Ser Thr Thr Thr
 325 330 335

Gln Glu Thr Ala Thr Val Asn Gly Val Pro Gln Leu Ile Leu Pro Gly
 340 345 350

Thr Phe Trp Asp Glu Ser Arg Arg Ala Glu Leu Leu Ala Asp Arg Gly
 355 360 365

Ala Gly Leu Val Leu Asp Pro Ala Thr Phe Thr Glu Asp Asp Val Arg
 370 375 380

Gly Gln Leu Ala Arg Leu Leu Asp Glu Pro Ser Phe Ala Ala Asn Ala
 385 390 395 400

Ala Leu Ile Arg Arg Glu Ile Glu Glu Ser Pro Ser Pro His Asp Ile
 405 410 415

Val Pro Arg Leu Glu Lys Leu Val Ala Glu Arg Glu Asn Arg Arg Thr
 420 425 430

Gly Gln Ser Asp Gly His Pro
 435

<210> 31
 <211> 1389
 <212> DNA
 <213> Saccharopolyspora spinosa

<220>
 <221> CDS
 <222> (1) .. (1386)
 <223> ORF13; 3,4-Dehydratase

<400> 31
 atg cag agc cgg aaa acc aga gcg ctg ggg aaa ggg cgc gcc aga gtg 48
 Met Gln Ser Arg Lys Thr Arg Ala Leu Gly Lys Gly Arg Ala Arg Val
 1 5 10 15
 act tcg tgt gac gac act tgc gct acc gct act gag atg gtg ccg gat 96
 Thr Ser Cys Asp Asp Thr Cys Ala Thr Ala Thr Glu Met Val Pro Asp
 20 25 30
 gcc aag gac cgg ata ttg gca tcc gta cgc gat tac cac cgc gaa cag 144
 Ala Lys Asp Arg Ile Leu Ala Ser Val Arg Asp Tyr His Arg Glu Gln
 35 40 45
 gaa tcc ccg acc ttc gtg gct gga tcg acg ccg atc cgg cca tcg ggc 192
 Glu Ser Pro Thr Phe Val Ala Gly Ser Thr Pro Ile Arg Pro Ser Gly
 50 55 60
 gcc gtg ctc gac gag gac gac cgg gtg gca ctg gtg gaa gcc gcg ctg 240
 Ala Val Leu Asp Glu Asp Asp Arg Val Ala Leu Val Glu Ala Ala Leu
 65 70 75 80
 gag ctc cgg atc gcc gcg ggc ggg aat gca cgg cga ttc gag agc gag 288
 Glu Leu Arg Ile Ala Ala Gly Gly Asn Ala Arg Arg Phe Glu Ser Glu
 85 90 95
 ttc gcc cgc ttc ttc ggc ctc cgc aag gct cat ctc gtc aac tcc ggt 336
 Phe Ala Arg Phe Phe Gly Leu Arg Lys Ala His Leu Val Asn Ser Gly
 100 105 110
 tcg tcg gcc aat ctc ctg gca ctg agt tcg ctt acc tcc ccc aaa ctc 384
 Ser Ser Ala Asn Leu Leu Ala Leu Ser Ser Leu Thr Ser Pro Lys Leu
 115 120 125
 ggc gag gca cga ctg cgg ccc ggc gac gaa gtg atc act gcg gcg gtc 432
 Gly Glu Ala Arg Leu Arg Pro Gly Asp Glu Val Ile Thr Ala Ala Val

130	135	140	
ggc ttc ccc acg acg atc aat ccg gcg gtc caa aac gga ctc gtc ccg			480
Gly Phe Pro Thr Thr Ile Asn Pro Ala Val Gln Asn Gly Leu Val Pro			
145	150	155	160
gta ttc gtc gac gtg gaa ctg ggc acc tac aac gca acg cca gac cgc			528
Val Phe Val Asp Val Glu Leu Gly Thr Tyr Asn Ala Thr Pro Asp Arg			
165	170	175	
atc aag gcc gcc gtc acg gaa cgg acg cga gcc atc atg ctg gcg cac			576
Ile Lys Ala Ala Val Thr Glu Arg Thr Arg Ala Ile Met Leu Ala His			
180	185	190	
acc ctg ggc aac ccc ttc gcc gct gac gaa atc gcg gag atc gca aaa			624
Thr Leu Gly Asn Pro Phe Ala Ala Asp Glu Ile Ala Glu Ile Ala Lys			
195	200	205	
gaa cac gag ctg ttc ctc gtc gaa gac aac tgt gat gcg gtg gga tcc			672
Glu His Glu Leu Phe Leu Val Glu Asp Asn Cys Asp Ala Val Gly Ser			
210	215	220	
acc tac cgg gga cgg ctg acc gga acc ttc ggc gac ctg aca acg gtc			720
Thr Tyr Arg Gly Arg Leu Thr Gly Thr Phe Gly Asp Leu Thr Thr Val			
225	230	235	240
agc ttc tat cct gcc cat cac atc acc agc ggc gag ggt ggc tgc gtg			768
Ser Phe Tyr Pro Ala His His Ile Thr Ser Gly Glu Gly Gly Cys Val			
245	250	255	
ttg acc ggc agc ctg gaa ttg gct cgc atc atc gag tcg ctg cgt gac			816
Leu Thr Gly Ser Leu Glu Leu Ala Arg Ile Ile Glu Ser Leu Arg Asp			
260	265	270	
tgg gga cgg gat tgc tgg tgc gag ccc ggc gtg gac aac acc tgc cgc			864
Trp Gly Arg Asp Cys Trp Cys Glu Pro Gly Val Asp Asn Thr Cys Arg			
275	280	285	
aag agg ttc gac tac cac ctc ggt acc ctt cca ccg ggc tac gac cac			912
Lys Arg Phe Asp Tyr His Leu Gly Thr Leu Pro Pro Gly Tyr Asp His			
290	295	300	
aag tac acg ttc tcc cac gtc ggt tac aac ctc aag acc acc gac ctg			960
Lys Tyr Thr Phe Ser His Val Gly Tyr Asn Leu Lys Thr Thr Asp Leu			
305	310	315	320
cag gcc gca ctt gcg ctg agc cag ttg agc aag att tcc gca ttc ggg			1008
Gln Ala Ala Leu Ala Leu Ser Gln Leu Ser Lys Ile Ser Ala Phe Gly			

325

330

335

tcg gca cgc cgc cgt aac tgg cga cgg ttg cgc gaa ggg ctg tcc ggg 1056
 Ser Ala Arg Arg Arg Asn Trp Arg Arg Leu Arg Glu Gly Leu Ser Gly
 340 345 350

ttg ccg ggc ctg ctg ctg ccg gta gcc aca ccg cac agc gac ccg agc 1104
 Leu Pro Gly Leu Leu Leu Pro Val Ala Thr Pro His Ser Asp Pro Ser
 355 360 365

tgg ttc ggg ttt gcg atc acc atc agt gcg gac gcc ggg ttc acc cgt 1152
 Trp Phe Gly Phe Ala Ile Thr Ile Ser Ala Asp Ala Gly Phe Thr Arg
 370 375 380

gcc gcc ctg gtg aac ttc ctg gaa tcc cgc aac atc ggc acc cga ctg 1200
 Ala Ala Leu Val Asn Phe Leu Glu Ser Arg Asn Ile Gly Thr Arg Leu
 385 390 395 400

ctg ttc ggc ggt aac atc acc cgg cac ccg gcc ttc gag cag gtg cgg 1248
 Leu Phe Gly Gly Asn Ile Thr Arg His Pro Ala Phe Glu Gln Val Arg
 405 410 415

tac cgg atc gcc gac gcg ctc acc aac agc gac atc gtc acc gac cga 1296
 Tyr Arg Ile Ala Asp Ala Leu Thr Asn Ser Asp Ile Val Thr Asp Arg
 420 425 430

acc ttc tgg gtc ggc gtc tac cca ggc ata acg gac caa atg atc gac 1344
 Thr Phe Trp Val Gly Val Tyr Pro Gly Ile Thr Asp Gln Met Ile Asp
 435 440 445

tac gtc gtc gaa tca atc gct gaa ttc gtg gcc aag agt tcc tag 1389
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 450 455 460

<210> 32

<211> 462

<212> PRT

<213> Saccharopolyspora spinosa

<400> 32

Met Gln Ser Arg Lys Thr Arg Ala Leu Gly Lys Gly Arg Ala Arg Val
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Thr Ser Cys Asp Asp Thr Cys Ala Thr Ala Thr Glu Met Val Pro Asp
 20 25 30

Ala Lys Asp Arg Ile Leu Ala Ser Val Arg Asp Tyr His Arg Glu Gln

35	40	45
Glu Ser Pro Thr Phe Val Ala Gly Ser Thr Pro Ile Arg Pro Ser Gly		
50	55	60
Ala Val Leu Asp Glu Asp Asp Arg Val Ala Leu Val Glu Ala Ala Leu		
65	70	75
Glu Leu Arg Ile Ala Ala Gly Gly Asn Ala Arg Arg Phe Glu Ser Glu		
85	90	95
Phe Ala Arg Phe Phe Gly Leu Arg Lys Ala His Leu Val Asn Ser Gly		
100	105	110
Ser Ser Ala Asn Leu Leu Ala Leu Ser Ser Leu Thr Ser Pro Lys Leu		
115	120	125
Gly Glu Ala Arg Leu Arg Pro Gly Asp Glu Val Ile Thr Ala Ala Val		
130	135	140
Gly Phe Pro Thr Thr Ile Asn Pro Ala Val Gln Asn Gly Leu Val Pro		
145	150	155
Val Phe Val Asp Val Glu Leu Gly Thr Tyr Asn Ala Thr Pro Asp Arg		
165	170	175
Ile Lys Ala Ala Val Thr Glu Arg Thr Arg Ala Ile Met Leu Ala His		
180	185	190
Thr Leu Gly Asn Pro Phe Ala Ala Asp Glu Ile Ala Glu Ile Ala Lys		
195	200	205
Glu His Glu Leu Phe Leu Val Glu Asp Asn Cys Asp Ala Val Gly Ser		
210	215	220
Thr Tyr Arg Gly Arg Leu Thr Gly Thr Phe Gly Asp Leu Thr Thr Val		
225	230	235
Ser Phe Tyr Pro Ala His His Ile Thr Ser Gly Glu Gly Gly Cys Val		
245	250	255
Leu Thr Gly Ser Leu Glu Leu Ala Arg Ile Ile Glu Ser Leu Arg Asp		
260	265	270
Trp Gly Arg Asp Cys Trp Cys Glu Pro Gly Val Asp Asn Thr Cys Arg		
275	280	285
Lys Arg Phe Asp Tyr His Leu Gly Thr Leu Pro Pro Gly Tyr Asp His		

290

295

300

Lys Tyr Thr Phe Ser His Val Gly Tyr Asn Leu Lys Thr Thr Asp Leu
 305 310 315 320

Gln Ala Ala Leu Ala Leu Ser Gln Leu Ser Lys Ile Ser Ala Phe Gly
 325 330 335

Ser Ala Arg Arg Arg Asn Trp Arg Arg Leu Arg Glu Gly Leu Ser Gly
 340 345 350

Leu Pro Gly Leu Leu Leu Pro Val Ala Thr Pro His Ser Asp Pro Ser
 355 360 365

Trp Phe Gly Phe Ala Ile Thr Ile Ser Ala Asp Ala Gly Phe Thr Arg
 370 375 380

Ala Ala Leu Val Asn Phe Leu Glu Ser Arg Asn Ile Gly Thr Arg Leu
 385 390 395 400

Leu Phe Gly Gly Asn Ile Thr Arg His Pro Ala Phe Glu Gln Val Arg
 405 410 415

Tyr Arg Ile Ala Asp Ala Leu Thr Asn Ser Asp Ile Val Thr Asp Arg
 420 425 430

Thr Phe Trp Val Gly Val Tyr Pro Gly Ile Thr Asp Gln Met Ile Asp
 435 440 445

Tyr Val Val Glu Ser Ile Ala Glu Phe Val Ala Lys Ser Ser
 450 455 460

<210> 33

<211> 1158

<212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1)..(1155)

<223> ORF14; 4-Aminotransferase

<400> 33

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 Val Ile Asn Leu His Gln Pro Ile Leu Gly Thr Glu Glu Leu Asp Ala

1

5

10

15

atc gcg gag gtg ttc gcc tcc aac tgg atc ggg ctc ggg ccg cgc acc 96
 Ile Ala Glu Val Phe Ala Ser Asn Trp Ile Gly Leu Gly Pro Arg Thr
 20 25 30

cgg acg ttc gag gcc gaa ttc gcc cac cac ctg gga gtg gat ccc gaa 144
 Arg Thr Phe Glu Ala Glu Phe Ala His His Leu Gly Val Asp Pro Glu
 35 40 45

cag gtc gtg ttc ctc aac tcg ggg act gcc gcg ctg ttc ctt acc gtg 192
 Gln Val Val Phe Leu Asn Ser Gly Thr Ala Ala Leu Phe Leu Thr Val
 50 55 60

cag gtg ctc gac ctc ggc cca ggc gac gac gtg gta ctt cct tcg ata 240
 Gln Val Leu Asp Leu Gly Pro Gly Asp Asp Val Val Leu Pro Ser Ile
 65 70 75 80

agc ttc gtg gcg gcg gcc aac gcc atc gca tcc tcc ggt gcc cgc ccg 288
 Ser Phe Val Ala Ala Ala Asn Ala Ile Ala Ser Ser Gly Ala Arg Pro
 85 90 95

gtg ttc tgc gac gtc gac ccc cgg acg ttg aac ccc acg ctg gat gat 336
 Val Phe Cys Asp Val Asp Pro Arg Thr Leu Asn Pro Thr Leu Asp Asp
 100 105 110

gtg gcg agg gcc atc acg ccg gcg acc aag gcc gta ttg ctg ctc cac 384
 Val Ala Arg Ala Ile Thr Pro Ala Thr Lys Ala Val Leu Leu Leu His
 115 120 125

tat gga gga tcg ccg gga gaa gtc acc gcg atc gcc gat ttc tgc cgt 432
 Tyr Gly Gly Ser Pro Gly Glu Val Thr Ala Ile Ala Asp Phe Cys Arg
 130 135 140

gaa aag ggc ctc atg ctc atc gag gac tcc gcc tgc gcg gtg gca tcg 480
 Glu Lys Gly Leu Met Leu Ile Glu Asp Ser Ala Cys Ala Val Ala Ser
 145 150 155 160

tcc gtg cac ggc acc gct tgc gga acc ttt ggt gac ctg gcc acg tgg 528
 Ser Val His Gly Thr Ala Cys Gly Thr Phe Gly Asp Leu Ala Thr Trp
 165 170 175

agt ttc gat gcg atg aag atc ctg gtc acc ggg gat ggg ggc atg ttc 576
 Ser Phe Asp Ala Met Lys Ile Leu Val Thr Gly Asp Gly Gly Met Phe
 180 185 190

tac gcg gcg gat ccg gag ctg gcg cac cgc gca aga cga ctc gcc tac 624
 Tyr Ala Ala Asp Pro Glu Leu Ala His Arg Ala Arg Arg Leu Ala Tyr
 195 200 205

cac ggt ctt gag cag atg agc gga ttc gat tgc gcc aag tct tcc aac	672
His Gly Leu Glu Gln Met Ser Gly Phe Asp Ser Ala Lys Ser Ser Asn	
210 215 220	
cgc tgg tgg gat att cgc gtc gaa gac atc ggc cag cgg ctg atc ggg	720
Arg Trp Trp Asp Ile Arg Val Glu Asp Ile Gly Gln Arg Leu Ile Gly	
225 230 235 240	
aac gac atg acg gca gcg ctt ggc agc gtg cag ctg cgc aaa ctg cca	768
Asn Asp Met Thr Ala Ala Leu Gly Ser Val Gln Leu Arg Lys Leu Pro	
245 250 255	
gaa ttc atc aac agg cgt aga gaa atc gct acg cag tac gac cgg ttg	816
Glu Phe Ile Asn Arg Arg Arg Glu Ile Ala Thr Gln Tyr Asp Arg Leu	
260 265 270	
ctt tcc gat gtg ccg ggt gtc ctc cta ccg ccg acg cta ccg gat ggg	864
Leu Ser Asp Val Pro Gly Val Leu Leu Pro Pro Thr Leu Pro Asp Gly	
275 280 285	
cac gtc tgc tca cac tac ttc tac tgg gtc cag ctg gct ccg gag atc	912
His Val Ser Ser His Tyr Phe Tyr Trp Val Gln Leu Ala Pro Glu Ile	
290 295 300	
cgc gac cag gtg gcg cag caa atg ctg gaa cgc ggc atc tac acg agc	960
Arg Asp Gln Val Ala Gln Gln Met Leu Glu Arg Gly Ile Tyr Thr Ser	
305 310 315 320	
tac cgc tac ccg ccc ctg cac aag gtc ccc atc tac cgc gcg gac tgc	1008
Tyr Arg Tyr Pro Pro Leu His Lys Val Pro Ile Tyr Arg Ala Asp Cys	
325 330 335	
aag ctg cct tct gcg gag cac gcc tgc cgc aga aca ctc ctg cta cca	1056
Lys Leu Pro Ser Ala Glu His Ala Cys Arg Arg Thr Leu Leu Leu Pro	
340 345 350	
ctg cac cca agc ctt gac gac gcc gag gtg cgc acg gtg gct gac gag	1104
Leu His Pro Ser Leu Asp Asp Ala Glu Val Arg Thr Val Ala Asp Glu	
355 360 365	
ttc cag aag gcc gtc gaa cac cac atc agc caa aga tca cca ctc cga	1152
Phe Gln Lys Ala Val Glu His His Ile Ser Gln Arg Ser Pro Leu Arg	
370 375 380	
aag tga	1158
Lys	
385	

<210> 34

<211> 385

<212> PRT

<213> Saccharopolyspora spinosa

<400> 34

Val Ile Asn Leu His Gln Pro Ile Leu Gly Thr Glu Glu Leu Asp Ala
 1 5 10 15

Ile Ala Glu Val Phe Ala Ser Asn Trp Ile Gly Leu Gly Pro Arg Thr
 20 25 30

Arg Thr Phe Glu Ala Glu Phe Ala His His Leu Gly Val Asp Pro Glu
 35 40 45

Gln Val Val Phe Leu Asn Ser Gly Thr Ala Ala Leu Phe Leu Thr Val
 50 55 60

Gln Val Leu Asp Leu Gly Pro Gly Asp Asp Val Val Leu Pro Ser Ile
 65 70 75 80

Ser Phe Val Ala Ala Ala Asn Ala Ile Ala Ser Ser Gly Ala Arg Pro
 85 90 95

Val Phe Cys Asp Val Asp Pro Arg Thr Leu Asn Pro Thr Leu Asp Asp
 100 105 110

Val Ala Arg Ala Ile Thr Pro Ala Thr Lys Ala Val Leu Leu Leu His
 115 120 125

Tyr Gly Gly Ser Pro Gly Glu Val Thr Ala Ile Ala Asp Phe Cys Arg
 130 135 140

Glu Lys Gly Leu Met Leu Ile Glu Asp Ser Ala Cys Ala Val Ala Ser
 145 150 155 160

Ser Val His Gly Thr Ala Cys Gly Thr Phe Gly Asp Leu Ala Thr Trp
 165 170 175

Ser Phe Asp Ala Met Lys Ile Leu Val Thr Gly Asp Gly Gly Met Phe
 180 185 190

Tyr Ala Ala Asp Pro Glu Leu Ala His Arg Ala Arg Arg Leu Ala Tyr
 195 200 205

His Gly Leu Glu Gln Met Ser Gly Phe Asp Ser Ala Lys Ser Ser Asn

210	215	220
Arg Trp Trp Asp Ile Arg Val Glu Asp Ile Gly Gln Arg Leu Ile Gly		
225	230	235 240
Asn Asp Met Thr Ala Ala Leu Gly Ser Val Gln Leu Arg Lys Leu Pro		
245	250	255
Glu Phe Ile Asn Arg Arg Arg Glu Ile Ala Thr Gln Tyr Asp Arg Leu		
260	265	270
Leu Ser Asp Val Pro Gly Val Leu Leu Pro Pro Thr Leu Pro Asp Gly		
275	280	285
His Val Ser Ser His Tyr Phe Tyr Trp Val Gln Leu Ala Pro Glu Ile		
290	295	300
Arg Asp Gln Val Ala Gln Gln Met Leu Glu Arg Gly Ile Tyr Thr Ser		
305	310	315 320
Tyr Arg Tyr Pro Pro Leu His Lys Val Pro Ile Tyr Arg Ala Asp Cys		
325	330	335
Lys Leu Pro Ser Ala Glu His Ala Cys Arg Arg Thr Leu Leu Leu Pro		
340	345	350
Leu His Pro Ser Leu Asp Asp Ala Glu Val Arg Thr Val Ala Asp Glu		
355	360	365
Phe Gln Lys Ala Val Glu His His Ile Ser Gln Arg Ser Pro Leu Arg		
370	375	380
Lys		
385		

<210> 35
 <211> 750
 <212> DNA
 <213> Saccharopolyspora spinosa

 <220>
 <221> CDS
 <222> (1) .. (747)
 <223> ORF15; N-Dimethyltransferase

 <400> 35

atg tcg cgc gtg agc gac aca ttc gca gaa acc tcc tcg gta tac agc	48
Met Ser Arg Val Ser Asp Thr Phe Ala Glu Thr Ser Ser Val Tyr Ser	
1 5 10 15	
cca gat cat gcc gac atc tac gac gcg atc cac tcc gcg cgt ggc cgg	96
Pro Asp His Ala Asp Ile Tyr Asp Ala Ile His Ser Ala Arg Gly Arg	
20 25 30	
gac tgg gca gcc gag gcc ggg gaa gta gtc cag ctc gta cgc acc agg	144
Asp Trp Ala Ala Glu Ala Gly Glu Val Val Gln Leu Val Arg Thr Arg	
35 40 45	
ctg ccc gaa gca cag tcc cta ctc gac gtc gcc tgt ggg acc ggg gcg	192
Leu Pro Glu Ala Gln Ser Leu Leu Asp Val Ala Cys Gly Thr Gly Ala	
50 55 60	
cac cta gag cga ttc cgt gcc gaa tac gcg aag gtc gcg ggg ctt gaa	240
His Leu Glu Arg Phe Arg Ala Glu Tyr Ala Lys Val Ala Gly Leu Glu	
65 70 75 80	
ctg tcc gat gcg atg cgg gag atc gcg atc aga cga gtc cct gag gta	288
Leu Ser Asp Ala Met Arg Glu Ile Ala Ile Arg Arg Val Pro Glu Val	
85 90 95	
ccg att cac atc ggt gac atc cgc gat ttc gac ctc ggc gag cca ttc	336
Pro Ile His Ile Gly Asp Ile Arg Asp Phe Asp Leu Gly Glu Pro Phe	
100 105 110	
gac gtc atc acc tgc ctg tgc ttt acc gcg gct tac atg cgg acc gtt	384
Asp Val Ile Thr Cys Leu Cys Phe Thr Ala Ala Tyr Met Arg Thr Val	
115 120 125	
gac gac ctg cga cgc gtg acg cgg aac atg gcc cgg cac ctg gcc cct	432
Asp Asp Leu Arg Arg Val Thr Arg Asn Met Ala Arg His Leu Ala Pro	
130 135 140	
ggt gga gtc gcg gtc atc gaa ccc tgg tgg ttt ccc gac aag ttc atc	480
Gly Gly Val Ala Val Ile Glu Pro Trp Trp Phe Pro Asp Lys Phe Ile	
145 150 155 160	
gac ggg ttc gtc acc gga gcc gtc gcg cac cac ggc gag cgg gtg atc	528
Asp Gly Phe Val Thr Gly Ala Val Ala His His Gly Glu Arg Val Ile	
165 170 175	
agc cgg cta tcg cac tcg gtc ctg gag ggc cgt acg agc cgg atg acc	576
Ser Arg Leu Ser His Ser Val Leu Glu Gly Arg Thr Ser Arg Met Thr	
180 185 190	

gtc cgc tac aca gtc gcc gaa ccc acc ggg atc cgg gac ttc aca gag 624
 Val Arg Tyr Thr Val Ala Glu Pro Thr Gly Ile Arg Asp Phe Thr Glu
 195 200 205

ttc gaa atc ctc tcg ctg ttc act gag gac gag tac acc gcc gcg ctc 672
 Phe Glu Ile Leu Ser Leu Phe Thr Glu Asp Glu Tyr Thr Ala Ala Leu
 210 215 220

gaa gac gca ggg atc cgc gcg gaa tac ctt cct gga gca ccg aac ggc 720
 Glu Asp Ala Gly Ile Arg Ala Glu Tyr Leu Pro Gly Ala Pro Asn Gly
 225 230 235 240

cga ggc ctg ttc gtc gga atc cgc aac tga 750
 Arg Gly Leu Phe Val Gly Ile Arg Asn
 245

<210> 36

<211> 249

<212> PRT

<213> Saccharopolyspora spinosa

<400> 36

Met Ser Arg Val Ser Asp Thr Phe Ala Glu Thr Ser Ser Val Tyr Ser
 1 5 10 15

Pro Asp His Ala Asp Ile Tyr Asp Ala Ile His Ser Ala Arg Gly Arg
 20 25 30

Asp Trp Ala Ala Glu Ala Gly Glu Val Val Gln Leu Val Arg Thr Arg
 35 40 45

Leu Pro Glu Ala Gln Ser Leu Leu Asp Val Ala Cys Gly Thr Gly Ala
 50 55 60

His Leu Glu Arg Phe Arg Ala Glu Tyr Ala Lys Val Ala Gly Leu Glu
 65 70 75 80

Leu Ser Asp Ala Met Arg Glu Ile Ala Ile Arg Arg Val Pro Glu Val
 85 90 95

Pro Ile His Ile Gly Asp Ile Arg Asp Phe Asp Leu Gly Glu Pro Phe
 100 105 110

Asp Val Ile Thr Cys Leu Cys Phe Thr Ala Ala Tyr Met Arg Thr Val
 115 120 125

Asp Asp Leu Arg Arg Val Thr Arg Asn Met Ala Arg His Leu Ala Pro

130 135 140
 Gly Gly Val Ala Val Ile Glu Pro Trp Trp Phe Pro Asp Lys Phe Ile
 145 150 155 160
 Asp Gly Phe Val Thr Gly Ala Val Ala His His Gly Glu Arg Val Ile
 165 170 175
 Ser Arg Leu Ser His Ser Val Leu Glu Gly Arg Thr Ser Arg Met Thr
 180 185 190
 Val Arg Tyr Thr Val Ala Glu Pro Thr Gly Ile Arg Asp Phe Thr Glu
 195 200 205
 Phe Glu Ile Leu Ser Leu Phe Thr Glu Asp Glu Tyr Thr Ala Ala Leu
 210 215 220
 Glu Asp Ala Gly Ile Arg Ala Glu Tyr Leu Pro Gly Ala Pro Asn Gly
 225 230 235 240
 Arg Gly Leu Phe Val Gly Ile Arg Asn
 245

<210> 37

<211> 726

<212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1) .. (723)

<223> ORF16; 3,4-Reduktase

<400> 37

atg agc gaa cag acg att gca ctg gtc acc ggc gca aac aag gga atc 48
 Met Ser Glu Gln Thr Ile Ala Leu Val Thr Gly Ala Asn Lys Gly Ile
 1 5 10 15

gga tac gag atc gcg gcc ggg ctc ggc gcg ctg ggg tgg agc gtc gga 96
 Gly Tyr Glu Ile Ala Ala Gly Leu Gly Ala Leu Gly Trp Ser Val Gly
 20 25 30

atc ggg gca cgg gac cac cag cgc ggg gag gat gcc gtg gcg aaa ttg 144
 Ile Gly Ala Arg Asp His Gln Arg Gly Glu Asp Ala Val Ala Lys Leu
 35 40 45

cgt gcg gac ggc gtc gat gcg ttc gcg gta tcc ctg gac gtg aca gac	192
Arg Ala Asp Gly Val Asp Ala Phe Ala Val Ser Leu Asp Val Thr Asp	
50 55 60	
gac gcg agc gtc gcg gct gct gcg gct ctg ctc gag gag cgc gcc ggc	240
Asp Ala Ser Val Ala Ala Ala Ala Ala Leu Leu Glu Glu Arg Ala Gly	
65 70 75 80	
cgg ctc gat gtg ctg gtt aat aac gcc ggc atc gcc ggg gca tgg ccg	288
Arg Leu Asp Val Leu Val Asn Asn Ala Gly Ile Ala Gly Ala Trp Pro	
85 90 95	
gag gag ccc tcg acc gtc aca ccg gcg agc ctc cgg gcg gtg gtg gag	336
Glu Glu Pro Ser Thr Val Thr Pro Ala Ser Leu Arg Ala Val Val Glu	
100 105 110	
acc aac gtg atc ggc gtc gtt cgg gtt acc aac gct atg ctg ccg ttg	384
Thr Asn Val Ile Gly Val Val Arg Val Thr Asn Ala Met Leu Pro Leu	
115 120 125	
cta cgc cgc tcc gag cgc ccg cgg atc gtc aac cag tcc agc cac gtc	432
Leu Arg Arg Ser Glu Arg Pro Arg Ile Val Asn Gln Ser Ser His Val	
130 135 140	
gct tcc ctg acc ttg caa acc acg ccg ggc gtc gac ctc ggc ggg atc	480
Ala Ser Leu Thr Leu Gln Thr Thr Pro Gly Val Asp Leu Gly Gly Ile	
145 150 155 160	
agc gga gcc tac tca ccg tcg aag acg ttc ctc aac gcg atc acc atc	528
Ser Gly Ala Tyr Ser Pro Ser Lys Thr Phe Leu Asn Ala Ile Thr Ile	
165 170 175	
cag tac gcc aag gaa ctc agc gat acc aac atc aaa atc aac aac gcc	576
Gln Tyr Ala Lys Glu Leu Ser Asp Thr Asn Ile Lys Ile Asn Asn Ala	
180 185 190	
tgc ccc ggc tac gtc gcg acc gac ctt aac ggc ttc cac gga acc agc	624
Cys Pro Gly Tyr Val Ala Thr Asp Leu Asn Gly Phe His Gly Thr Ser	
195 200 205	
acg ccg gca gac ggt gcc agg atc gcc att cgg ctc gcc acg ctg cca	672
Thr Pro Ala Asp Gly Ala Arg Ile Ala Ile Arg Leu Ala Thr Leu Pro	
210 215 220	
gac gac ggc ccg acc gga ggc atg ttc gac gac gcc ggg aat gtg ccc	720
Asp Asp Gly Pro Thr Gly Gly Met Phe Asp Asp Ala Gly Asn Val Pro	
225 230 235 240	

tgg tga
Trp

726

<210> 38

<211> 241

<212> PRT

<213> *Saccharopolyspora spinosa*

<400> 38

Met Ser Glu Gln Thr Ile Ala Leu Val Thr Gly Ala Asn Lys Gly Ile

1

5

10

15

Gly Tyr Glu Ile Ala Ala Gly Leu Gly Ala Leu Gly Trp Ser Val Gly

20

25

30

Ile Gly Ala Arg Asp His Gln Arg Gly Glu Asp Ala Val Ala Lys Leu

35

40

45

Arg Ala Asp Gly Val Asp Ala Phe Ala Val Ser Leu Asp Val Thr Asp

50

55

60

Asp Ala Ser Val Ala Ala Ala Ala Ala Leu Leu Glu Glu Arg Ala Gly

65

70

75

80

Arg Leu Asp Val Leu Val Asn Asn Ala Gly Ile Ala Gly Ala Trp Pro

85

90

95

Glu Glu Pro Ser Thr Val Thr Pro Ala Ser Leu Arg Ala Val Val Glu

100

105

110

Thr Asn Val Ile Gly Val Val Arg Val Thr Asn Ala Met Leu Pro Leu

115

120

125

Leu Arg Arg Ser Glu Arg Pro Arg Ile Val Asn Gln Ser Ser His Val

130

135

140

Ala Ser Leu Thr Leu Gln Thr Thr Pro Gly Val Asp Leu Gly Gly Ile

145

150

155

160

Ser Gly Ala Tyr Ser Pro Ser Lys Thr Phe Leu Asn Ala Ile Thr Ile

165

170

175

Gln Tyr Ala Lys Glu Leu Ser Asp Thr Asn Ile Lys Ile Asn Asn Ala

180

185

190

Cys Pro Gly Tyr Val Ala Thr Asp Leu Asn Gly Phe His Gly Thr Ser

195

200

205

Thr Pro Ala Asp Gly Ala Arg Ile Ala Ile Arg Leu Ala Thr Leu Pro
 210 215 220

Asp Asp Gly Pro Thr Gly Gly Met Phe Asp Asp Ala Gly Asn Val Pro
 225 230 235 240

Trp

<210> 39

<211> 837

<212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1)..(834)

<223> ORF17; Transkriptions-Regulator

<400> 39

atg gag acg cgg gag ttg cgg tac ttc gtt gca gtc gcc gag gag ttg 48
 Met Glu Thr Arg Glu Leu Arg Tyr Phe Val Ala Val Ala Glu Glu Leu
 1 5 10 15

cac ttc ggc cgg gcc gcc cag cgc ctg ggc atc gcc cag ccg ccg ctg 96
 His Phe Gly Arg Ala Ala Gln Arg Leu Gly Ile Ala Gln Pro Pro Leu
 20 25 30

tcg cgg acg atc gcc cag ctc gag caa cga ctc gga gtc gtg ttg ctg 144
 Ser Arg Thr Ile Ala Gln Leu Glu Gln Arg Leu Gly Val Val Leu Leu
 35 40 45

caa cgc acc agc cgc aaa gtc tcg ctc acc gaa gcc ggg gca atg ctg 192
 Gln Arg Thr Ser Arg Lys Val Ser Leu Thr Glu Ala Gly Ala Met Leu
 50 55 60

ctg acc gaa ggc cgg gcg atc ctc ggc gcg ctg gca gca gcc gag cga 240
 Leu Thr Glu Gly Arg Ala Ile Leu Gly Ala Leu Ala Ala Ala Glu Arg
 65 70 75 80

cgc acc cag cgt gcc gcg acg agc cag ccc tcg cta gtc ctg gct gcc 288
 Arg Thr Gln Arg Ala Ala Thr Ser Gln Pro Ser Leu Val Leu Ala Ala
 85 90 95

aag gcc ggc gcc tcc ggt gag ctg ctg gcg aag ttg ctc gac gcg tac 336

Lys Ala Gly Ala Ser Gly Glu Leu Leu Ala Lys Leu Leu Asp Ala Tyr
 100 105 110

gcc gcc gag ccg gga gcc gtg gcc gtc gac ctg ctg ctc tgc gaa tcc 384
 Ala Ala Glu Pro Gly Ala Val Ala Val Asp Leu Leu Leu Cys Glu Ser
 115 120 125

cag ccc cag aaa acg ctg cat gac ggc cgg gcc gac gtg gcg ctg ttg 432
 Gln Pro Gln Lys Thr Leu His Asp Gly Arg Ala Asp Val Ala Leu Leu
 130 135 140

cat caa ccc ttc gac ccg acg gcc gaa ctc gac atc gaa att ctg aac 480
 His Gln Pro Phe Asp Pro Thr Ala Glu Leu Asp Ile Glu Ile Leu Asn
 145 150 155 160

acc gag caa caa gtc gcc att ctt ccg acc tcg cat ccg ctt gcc agc 528
 Thr Glu Gln Gln Val Ala Ile Leu Pro Thr Ser His Pro Leu Ala Ser
 165 170 175

gag ccc cat gta cgg atg gcg gat gtc agc tca ctg ccg gat ctc ccg 576
 Glu Pro His Val Arg Met Ala Asp Val Ser Ser Leu Pro Asp Leu Pro
 180 185 190

ctt gcg cgc tgg ccc ggc ccc gac ggc gtc tat cca gat ggc ccc ggc 624
 Leu Ala Arg Trp Pro Gly Pro Asp Gly Val Tyr Pro Asp Gly Pro Gly
 195 200 205

gtg gaa gta cgc aac cag acg caa ctg ttc caa atg atc gca ctc ggc 672
 Val Glu Val Arg Asn Gln Thr Gln Leu Phe Gln Met Ile Ala Leu Gly
 210 215 220

cgc act acc gtg gtc atg ccc gaa tcc agt cgc gtc aac ctg ctc gaa 720
 Arg Thr Thr Val Val Met Pro Glu Ser Ser Arg Val Asn Leu Leu Glu
 225 230 235 240

ggc ctc gcc gcc gta ccg gtt cta gac gcg ccg gac gtg acg aca gtc 768
 Gly Leu Ala Ala Val Pro Val Leu Asp Ala Pro Asp Val Thr Thr Val
 245 250 255

atc gcc tgg ccg ccc cac agc cgc tcc cga gca ctc gcc ggc ttg gtc 816
 Ile Ala Trp Pro Pro His Ser Arg Ser Arg Ala Leu Ala Gly Leu Val
 260 265 270

cgc gtg gcc aca ctc ctc taa 837
 Arg Val Ala Thr Leu Leu
 275

<210> 40

<211> 278

<212> PRT

<213> Saccharopolyspora spinosa

<400> 40

Met Glu Thr Arg Glu Leu Arg Tyr Phe Val Ala Val Ala Glu Glu Leu
 1 5 10 15

His Phe Gly Arg Ala Ala Gln Arg Leu Gly Ile Ala Gln Pro Pro Leu
 20 25 30

Ser Arg Thr Ile Ala Gln Leu Glu Gln Arg Leu Gly Val Val Leu Leu
 35 40 45

Gln Arg Thr Ser Arg Lys Val Ser Leu Thr Glu Ala Gly Ala Met Leu
 50 55 60

Leu Thr Glu Gly Arg Ala Ile Leu Gly Ala Leu Ala Ala Ala Glu Arg
 65 70 75 80

Arg Thr Gln Arg Ala Ala Thr Ser Gln Pro Ser Leu Val Leu Ala Ala
 85 90 95

Lys Ala Gly Ala Ser Gly Glu Leu Leu Ala Lys Leu Leu Asp Ala Tyr
 100 105 110

Ala Ala Glu Pro Gly Ala Val Ala Val Asp Leu Leu Leu Cys Glu Ser
 115 120 125

Gln Pro Gln Lys Thr Leu His Asp Gly Arg Ala Asp Val Ala Leu Leu
 130 135 140

His Gln Pro Phe Asp Pro Thr Ala Glu Leu Asp Ile Glu Ile Leu Asn
 145 150 155 160

Thr Glu Gln Gln Val Ala Ile Leu Pro Thr Ser His Pro Leu Ala Ser
 165 170 175

Glu Pro His Val Arg Met Ala Asp Val Ser Ser Leu Pro Asp Leu Pro
 180 185 190

Leu Ala Arg Trp Pro Gly Pro Asp Gly Val Tyr Pro Asp Gly Pro Gly
 195 200 205

Val Glu Val Arg Asn Gln Thr Gln Leu Phe Gln Met Ile Ala Leu Gly
 210 215 220

Arg Thr Thr Val Val Met Pro Glu Ser Ser Arg Val Asn Leu Leu Glu
 225 230 235 240

Gly Leu Ala Ala Val Pro Val Leu Asp Ala Pro Asp Val Thr Thr Val
 245 250 255

Ile Ala Trp Pro Pro His Ser Arg Ser Arg Ala Leu Ala Gly Leu Val
 260 265 270

Arg Val Ala Thr Leu Leu
 275

<210> 41

<211> 7788

<212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1) .. (7785)

<223> ORF18; Polyketidsynthase

<400> 41

atg agc gaa gcc. ggg aac ctg ata gcc gtc atc gga ctg tcc tgc cgc 48
 Met Ser Glu Ala Gly Asn Leu Ile Ala Val Ile Gly Leu Ser Cys Arg
 1 5 10 15

cta ccc cag gcg cct gac ccg gct tcc ttc tgg cgg ttg ctg cgc acc 96
 Leu Pro Gln Ala Pro Asp Pro Ala Ser Phe Trp Arg Leu Leu Arg Thr
 20 25 30

gga acg gac gcc atc acc acg gtc ccg gaa ggg cgg tgg ggc gac ccg 144
 Gly Thr Asp Ala Ile Thr Thr Val Pro Glu Gly Arg Trp Gly Asp Pro
 35 40 45

ttg cct ggt cgg gat gcg ccc aag ggc. ccg gaa tgg ggt ggt ttc ctg 192
 Leu Pro Gly Arg Asp Ala Pro Lys Gly Pro Glu Trp Gly Gly Phe Leu
 50 55 60

gct gat gtc gac tgc ttc gat ccc gag ttc ttc ggg atc tcg ccg cga 240
 Ala Asp Val Asp Cys Phe Asp Pro Glu Phe Phe Gly Ile Ser Pro Arg
 65 70 75 80

gaa gcg. gca gcc gtg gat ccc cag cag agg ctg gct ctg gag ctc gcc 288
 Glu Ala Ala Ala Val Asp Pro Gln Gln Arg Leu Ala Leu Glu Leu Ala
 85 90 95

tgg gag gca ctc gaa gac gcc ggt atc ccc gcc ggc gag ctg cgc ggt	336
Trp Glu Ala Leu Glu Asp Ala Gly Ile Pro Ala Gly Glu Leu Arg Gly	
100 105 110	
act gcc gcc ggt gtg ttc atg ggg gcg atc tct gac gac tac gcc gcc	384
Thr Ala Ala Gly Val Phe Met Gly Ala Ile Ser Asp Asp Tyr Ala Ala	
115 120 125	
ctg ctg cgc gag agc ccg ccg gaa gtg gct gcg cag tac cgc ctc acc	432
Leu Leu Arg Glu Ser Pro Pro Glu Val Ala Ala Gln Tyr Arg Leu Thr	
130 135 140	
ggc acc cat cga agc ctg atc gcc aac cgc gtg tcc tat gtg ctc ggc	480
Gly Thr His Arg Ser Leu Ile Ala Asn Arg Val Ser Tyr Val Leu Gly	
145 150 155 160	
ctg cgc ggg cca agc ctg acg gtg gat tca ggt cag tcc tcg tcc ctg	528
Leu Arg Gly Pro Ser Leu Thr Val Asp Ser Gly Gln Ser Ser Ser Leu	
165 170 175	
gtc ggc gtg cat ctc gcc agc gag agc ctg cga cgg ggt gag tgc acg	576
Val Gly Val His Leu Ala Ser Glu Ser Leu Arg Arg Gly Glu Cys Thr	
180 185 190	
atc gca ctc gcc ggc ggc gtg aac ctc aac ctg gcc gcc gag agc aac	624
Ile Ala Leu Ala Gly Gly Val Asn Leu Asn Leu Ala Ala Glu Ser Asn	
195 200 205	
agc gct ctg atg gac ttc ggc gcg ctc tcc ccg gac ggt cgc tgc ttc	672
Ser Ala Leu Met Asp Phe Gly Ala Leu Ser Pro Asp Gly Arg Cys Phe	
210 215 220	
acc ttc gat gtg cgg gcg aac ggt tac gtc cgt ggt gag ggc ggc ggc	720
Thr Phe Asp Val Arg Ala Asn Gly Tyr Val Arg Gly Glu Gly Gly Gly	
225 230 235 240	
ctt gtc gtg ctg aag aag gcc gat cag gcg cac gcc gat ggc gac cgg	768
Leu Val Val Leu Lys Lys Ala Asp Gln Ala His Ala Asp Gly Asp Arg	
245 250 255	
atc tac tgc ctc atc cgc ggc agc gcg gtc aac aac gat ggg ggc ggt	816
Ile Tyr Cys Leu Ile Arg Gly Ser Ala Val Asn Asn Asp Gly Gly Gly	
260 265 270	
gcc ggg ctc acc gtt ccg gcg gcg gac gcc cag gcg gag ctg ctg cgc	864
Ala Gly Leu Thr Val Pro Ala Ala Asp Ala Gln Ala Glu Leu Leu Arg	
275 280 285	

cag gca tac cgg aac gcg ggc gtc gac ccg gcc gcc gtg cag tat gtc	912
Gln Ala Tyr Arg Asn Ala Gly Val Asp Pro Ala Ala Val Gln Tyr Val	
290 295 300	
gag ctc cac ggc agc gcg acc agg gtc ggg gat ccc gtc gaa gca gca	960
Glu Leu His Gly Ser Ala Thr Arg Val Gly Asp Pro Val Glu Ala Ala	
305 310 315 320	
gcc ctc gga gct gtc ctg ggg gcg gcg aga cgg ccc ggc gac gag ctg	1008
Ala Leu Gly Ala Val Leu Gly Ala Ala Arg Arg Pro Gly Asp Glu Leu	
325 330 335	
cgt gtg ggg tcg gcg aag acc aac gtc ggc cat ctg gaa gca gcg gcg	1056
Arg Val Gly Ser Ala Lys Thr Asn Val Gly His Leu Glu Ala Ala Ala	
340 345 350	
ggc gtc acc ggg ttg ctg aag acc gca ctc agc atc tgg cac cgc gaa	1104
Gly Val Thr Gly Leu Leu Lys Thr Ala Leu Ser Ile Trp His Arg Glu	
355 360 365	
ctg ccg ccg agt ctt cat ttc acc gcc ccc aac ccg gaa atc ccg ctg	1152
Leu Pro Pro Ser Leu His Phe Thr Ala Pro Asn Pro Glu Ile Pro Leu	
370 375 380	
gac gaa ttg aac cta cgc gtc cag cgt gat ctg ccg ccg tgg ccg gag	1200
Asp Glu Leu Asn Leu Arg Val Gln Arg Asp Leu Arg Pro Trp Pro Glu	
385 390 395 400	
agc gag ggg ccg ctg ctg gcc ggc gtc agc gcc ttc gga atg gga ggc	1248
Ser Glu Gly Pro Leu Leu Ala Gly Val Ser Ala Phe Gly Met Gly Gly	
405 410 415	
acg aac tgc cac ctg gtg ctc tcc ggc acg tcc ccg gtg gag cga ccg	1296
Thr Asn Cys His Leu Val Leu Ser Gly Thr Ser Arg Val Glu Arg Arg	
420 425 430	
cgc agt gga ccc gct gag gcg acc atg ccg tgg gtc ttg tcg gcc aga	1344
Arg Ser Gly Pro Ala Glu Ala Thr Met Pro Trp Val Leu Ser Ala Arg	
435 440 445	
aca ccg gtc gca ttg cgt gcg cag gcg gcg cgc ttg cac acg cac ctc	1392
Thr Pro Val Ala Leu Arg Ala Gln Ala Ala Arg Leu His Thr His Leu	
450 455 460	
aat acg gcc ggt caa agt ccg ttg gac gtc gcc tac tca ctg gcg acc	1440
Asn Thr Ala Gly Gln Ser Pro Leu Asp Val Ala Tyr Ser Leu Ala Thr	
465 470 475 480	

act cga tcc gcg ctg ccg cac cgg gcc gcg ctg gtc gcg gac gac gaa	1488
Thr Arg Ser Ala Leu Pro His Arg Ala Ala Leu Val Ala Asp Asp Glu	
485 490 495	
ccg aaa ctg ctc gcc ggg ttg aag gcc ctc gct gac ggc gac gac gcg	1536
Pro Lys Leu Leu Ala Gly Leu Lys Ala Leu Ala Asp Gly Asp Asp Ala	
500 505 510	
ccc acg ctg tgc cac ggc gcg act tcc ggc gag cgg gca gcg gtc ttc	1584
Pro Thr Leu Cys His Gly Ala Thr Ser Gly Glu Arg Ala Ala Val Phe	
515 520 525	
gtc ttt ccc gga cag ggc agc cag tgg atc ggg atg ggt agg cag ctg	1632
Val Phe Pro Gly Gln Gly Ser Gln Trp Ile Gly Met Gly Arg Gln Leu	
530 535 540	
ctc gaa acc tcc gag gtt ttc gcg gcg tcg atg tcg gac tgc gcc gac	1680
Leu Glu Thr Ser Glu Val Phe Ala Ala Ser Met Ser Asp Cys Ala Asp	
545 550 555 560	
gca ttg gcg ccg cac ctg gat tgg tcc ctg ctg gat gtg ctg cgc aac	1728
Ala Leu Ala Pro His Leu Asp Trp Ser Leu Leu Asp Val Leu Arg Asn	
565 570 575	
gcg gcc ggc gct gcg cac ctt gac cac gac gat gtc gtc cag ccc gcg	1776
Ala Ala Gly Ala Ala His Leu Asp His Asp Asp Val Val Gln Pro Ala	
580 585 590	
ctg ttc gcc atc atg gtc tcg ctc gcg gag ctc tgg cgt tcg tgg ggc	1824
Leu Phe Ala Ile Met Val Ser Leu Ala Glu Leu Trp Arg Ser Trp Gly	
595 600 605	
gtg cgt ccg gtg gcg gtc gtc ggg cac tcg cag ggg gag atc gcg gcg	1872
Val Arg Pro Val Ala Val Val Gly His Ser Gln Gly Glu Ile Ala Ala	
610 615 620	
gcc tgc gtc gcc ggg gcc ctg tcc gtc cgc gat gcc gcc agg gtg gtg	1920
Ala Cys Val Ala Gly Ala Leu Ser Val Arg Asp Ala Ala Arg Val Val	
625 630 635 640	
gcg gtg cgc agc agg ctt ctg acg gcg ctg gcc ggc agt ggc gcg atg	1968
Ala Val Arg Ser Arg Leu Leu Thr Ala Leu Ala Gly Ser Gly Ala Met	
645 650 655	
gcc tcg ttg cag cat ccc gcc gaa gag gtg cgg caa atc ctg ttg ccc	2016
Ala Ser Leu Gln His Pro Ala Glu Glu Val Arg Gln Ile Leu Leu Pro	
660 665 670	

tgg cgc gat cgg atc ggc gtg gcg ggg gtg aac gga ccg tcg tcg acc	2064
Trp Arg Asp Arg Ile Gly Val Ala Gly Val Asn Gly Pro Ser Ser Thr	
675 680 685	
ctg gtg tca ggg gac cgg gag gcg atg gcg gaa ctg ctg gcc gag tgc	2112
Leu Val Ser Gly Asp Arg Glu Ala Met Ala Glu Leu Leu Ala Glu Cys	
690 695 700	
gca gac cga gag ctg cgg atg cgc cgg att ccc gtt gaa tac gcc tcc	2160
Ala Asp Arg Glu Leu Arg Met Arg Arg Ile Pro Val Glu Tyr Ala Ser	
705 710 715 720	
cat tcg cct cac atc gag gtt gtc cgg gat gag ctg ctg ggg ctg ttg	2208
His Ser Pro His Ile Glu Val Val Arg Asp Glu Leu Leu Gly Leu Leu	
725 730 735	
gcg ccg gtc gaa ccc agg acg gga agc atc ccg atc tat tcg acg acg	2256
Ala Pro Val Glu Pro Arg Thr Gly Ser Ile Pro Ile Tyr Ser Thr Thr	
740 745 750	
acc ggg gac ctg ctg gac cgg ccg atg gac gcc gac tac tgg tac cgc	2304
Thr Gly Asp Leu Leu Asp Arg Pro Met Asp Ala Asp Tyr Trp Tyr Arg	
755 760 765	
aac ctt cgt caa ccg gtg ctg ttc gaa gcg gcc gtc gag gcc ctg ttg	2352
Asn Leu Arg Gln Pro Val Leu Phe Glu Ala Ala Val Glu Ala Leu Leu	
770 775 780	
aag cgg ggg tac gac gca ttc atc gag atc agc cca cac ccg gtg ctg	2400
Lys Arg Gly Tyr Asp Ala Phe Ile Glu Ile Ser Pro His Pro Val Leu	
785 790 795 800	
act gcg aac atc cag gaa acc gcc gtg cga gca ggg cgg gag gta gtg	2448
Thr Ala Asn Ile Gln Glu Thr Ala Val Arg Ala Gly Arg Glu Val Val	
805 810 815	
gcg ctg ggg aca ctg cgc cgc ggc gaa ggt ggc atg ccg cag gcg ctg	2496
Ala Leu Gly Thr Leu Arg Arg Gly Glu Gly Gly Met Arg Gln Ala Leu	
820 825 830	
acg tcg ctg gcc aga gca cac gta cac gga gtg gcc gcg gac tgg cac	2544
Thr Ser Leu Ala Arg Ala His Val His Gly Val Ala Ala Asp Trp His	
835 840 845	
gcg gtc ttc gcc ggt acc ggg gcg cag ccg gtc gac ctg ccg acg tac	2592
Ala Val Phe Ala Gly Thr Gly Ala Gln Arg Val Asp Leu Pro Thr Tyr	
850 855 860	

gcc ttt cag cga cag cgc tac tgg ctg gac gcg aag ctt ccc gac gtc 2640
 Ala Phe Gln Arg Gln Arg Tyr Trp Leu Asp Ala Lys Leu Pro Asp Val
 865 870 875 880

gcc atg ccc gag agc gac gtg tgg acg gcg ttg cgg gaa aag ctg cgg 2688
 Ala Met Pro Glu Ser Asp Val Ser Thr Ala Leu Arg Glu Lys Leu Arg
 885 890 895

tct tcg ccg agg gcg gac gtg gac tcg acg acc ctc acg atg atc cgg 2736
 Ser Ser Pro Arg Ala Asp Val Asp Ser Thr Thr Leu Thr Met Ile Arg
 900 905 910

gca cag gca gcc gtg gtc ctc ggc cac tcc gat ccg aaa gag gtg gac 2784
 Ala Gln Ala Ala Val Val Leu Gly His Ser Asp Pro Lys Glu Val Asp
 915 920 925

ccg gat cgg acg ttc aag gac ctg ggc ttc gat tcc tcg atg gtg gtc 2832
 Pro Asp Arg Thr Phe Lys Asp Leu Gly Phe Asp Ser Ser Met Val Val
 930 935 940

gag ctg tgc gac cgc cta aac gcc gcc aca ggt ctg cga ctc gca ccg 2880
 Glu Leu Cys Asp Arg Leu Asn Ala Ala Thr Gly Leu Arg Leu Ala Pro
 945 950 955 960

agc gtc gtt ttc gac tgt cct acg ccg gac aag ctc gcc cgc cag gta 2928
 Ser Val Val Phe Asp Cys Pro Thr Pro Asp Lys Leu Ala Arg Gln Val
 965 970 975

cgg acg ttg ttg ttg ggc gag ccg gct ccc atg acg tca cac cgg ccg 2976
 Arg Thr Leu Leu Leu Gly Glu Pro Ala Pro Met Thr Ser His Arg Pro
 980 985 990

gac tcc gat gcg gac gag cct atc gcc gtg atc ggg atg ggc tgt cgg 3024
 Asp Ser Asp Ala Asp Glu Pro Ile Ala Val Ile Gly Met Gly Cys Arg
 995 1000 1005

ttt ccg ggt ggg gtg tcc tcg ccc gag gag ttg tgg cag ttg gtc gcc 3072
 Phe Pro Gly Gly Val Ser Ser Pro Glu Glu Leu Trp Gln Leu Val Ala
 1010 1015 1020

gct ggg cgg gac gtc gtg tcc gag ttc ccg gct gac cga ggt tgg gac 3120
 Ala Gly Arg Asp Val Val Ser Glu Phe Pro Ala Asp Arg Gly Trp Asp
 1025 1030 1035 1040

ctg gag cgt gcg ggg aca tcg cac gtg cgc gcc ggc ggg ttc ttg cat 3168
 Leu Glu Arg Ala Gly Thr Ser His Val Arg Ala Gly Gly Phe Leu His
 1045 1050 1055

ggc gcc ccg gat ttt gac ccc ggg ttc ttc cgg att tcg ccg cgc gag	3216
Gly Ala Pro Asp Phe Asp Pro Gly Phe Phe Arg Ile Ser Pro Arg Glu	
1060 1065 1070	
gcg ttg gcg atg gat cca cag cag cgg ttg ctg ctg gaa atc gcc tgg	3264
Ala Leu Ala Met Asp Pro Gln Gln Arg Leu Leu Leu Glu Ile Ala Trp	
1075 1080 1085	
gaa gca gtc gaa cga ggc ggg atc aac ccg cag cac ctg cac gga agt	3312
Glu Ala Val Glu Arg Gly Gly Ile Asn Pro Gln His Leu His Gly Ser	
1090 1095 1100	
caa acc ggg gtc ttc gtc ggc gcg acc tcc ctg gac tac ggg cca cgc	3360
Gln Thr Gly Val Phe Val Gly Ala Thr Ser Leu Asp Tyr Gly Pro Arg	
1105 1110 1115 1120	
ctg cac gaa gcg tcc gag gag gcg gcc ggg tac gtg ctc acc ggc agc	3408
Leu His Glu Ala Ser Glu Glu Ala Ala Gly Tyr Val Leu Thr Gly Ser	
1125 1130 1135	
acc acg agt gtg gcg tcg ggt cgg gtt gcg tat tcg ttc ggg ttc gag	3456
Thr Thr Ser Val Ala Ser Gly Arg Val Ala Tyr Ser Phe Gly Phe Glu	
1140 1145 1150	
ggc cct gcg gtg acg gtg gat acg gcg tgt tcg tcg tcg ttg gtg gcc	3504
Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala	
1155 1160 1165	
ctg cat ttg gcg tgt cag tcg ttg cgt tcg ggt gag tgt gat ctg gcg	3552
Leu His Leu Ala Cys Gln Ser Leu Arg Ser Gly Glu Cys Asp Leu Ala	
1170 1175 1180	
ttg gcc ggt ggt gtg acc gtg atg gcc acg ccg ggg atg ttc gtg gag	3600
Leu Ala Gly Gly Val Thr Val Met Ala Thr Pro Gly Met Phe Val Glu	
1185 1190 1195 1200	
ttt tcg cgg cag cgt ggt ttg gcg ccg gat ggg cgg tgc aag tcg ttc	3648
Phe Ser Arg Gln Arg Gly Leu Ala Pro Asp Gly Arg Cys Lys Ser Phe	
1205 1210 1215	
gcg gag gcc gcc gac ggc acc ggc tgg tcc gag ggt gct ggc ctg gtt	3696
Ala Glu Ala Ala Asp Gly Thr Gly Trp Ser Glu Gly Ala Gly Leu Val	
1220 1225 1230	
cta ctg gag cgg ttg tcg gat gcc cgg cgg aat ggg cat gag gtg ctg	3744
Leu Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly His Glu Val Leu	
1235 1240 1245	

gcg gtt gtt cgt ggt agt gcg gtg aat cag gac ggt gcg tcg aat ggt	3792
Ala Val Val Arg Gly Ser Ala Val Asn Gln Asp Gly Ala Ser Asn Gly	
1250 1255 1260	
ttg acc gcg ccg aat ggt tcg tcg cag cag cgg gtg att gcc cag gca	3840
Leu Thr Ala Pro Asn Gly Ser Ser Gln Gln Arg Val Ile Ala Gln Ala	
1265 1270 1275 1280	
ttg gcg agt gcg ggg ttg tcg gtg tcc gat gtg gat gct gtg gag gcg	3888
Leu Ala Ser Ala Gly Leu Ser Val Ser Asp Val Asp Ala Val Glu Ala	
1285 1290 1295	
cat ggg acg ggc acg cgg ctt ggt gat ccg atc gag gcg cag gcg ctg	3936
His Gly Thr Gly Thr Arg Leu Gly Asp Pro Ile Glu Ala Gln Ala Leu	
1300 1305 1310	
atc gcc acc tac ggc cag ggc cgg ctt ccg gaa cgg cca ttg tgg ttg	3984
Ile Ala Thr Tyr Gly Gln Gly Arg Leu Pro Glu Arg Pro Leu Trp Leu	
1315 1320 1325	
ggc tcg atg aag tcg aac atc ggt cac gcg cag gca gct gcg ggg ata	4032
Gly Ser Met Lys Ser Asn Ile Gly His Ala Gln Ala Ala Ala Gly Ile	
1330 1335 1340	
gcc ggc gtc atg aag atg gtg atg gcg atg cgg cac ggg cag cta ccg	4080
Ala Gly Val Met Lys Met Val Met Ala Met Arg His Gly Gln Leu Pro	
1345 1350 1355 1360	
cgc acg ttg cac gtg gat gag ccg act tct ggg gtg gat tgg tcg gcg	4128
Arg Thr Leu His Val Asp Glu Pro Thr Ser Gly Val Asp Trp Ser Ala	
1365 1370 1375	
ggg acg gtt caa ctc ctt acg gag aac acg ccc tgg ccc ggg agt ggt	4176
Gly Thr Val Gln Leu Leu Thr Glu Asn Thr Pro Trp Pro Gly Ser Gly	
1380 1385 1390	
cgt gtt cgt cgg gtg ggg gtg tcg tcg ttc ggg atc agt ggt act aac	4224
Arg Val Arg Arg Val Gly Val Ser Ser Phe Gly Ile Ser Gly Thr Asn	
1395 1400 1405	
gcg cac gtc atc ctc gaa cag ccc ccg gga gtg ccg agt cag tct gcg	4272
Ala His Val Ile Leu Glu Gln Pro Pro Gly Val Pro Ser Gln Ser Ala	
1410 1415 1420	
ggg ccg ggt tcg ggc tct gtc gtg gat gtt ccg gtg gtg ccg tgg atg	4320
Gly Pro Gly Ser Gly Ser Val Val Asp Val Pro Val Val Pro Trp Met	
1425 1430 1435 1440	

gtg tcg ggc aaa aca ccc gaa gcg cta tcc gcg cag gca acg gcg ttg	4368
Val Ser Gly Lys Thr Pro Glu Ala Leu Ser Ala Gln Ala Thr Ala Leu	
1445 1450 1455	
atg acc tat ctg gac gag cga cct gat gtc tcc tcg ctg gat gtt ggg	4416
Met Thr Tyr Leu Asp Glu Arg Pro Asp Val Ser Ser Leu Asp Val Gly	
1460 1465 1470	
tac tcg ctg gcg ttg aca cgg tcg gcg ctg gat gag cga gcg gtg gtg	4464
Tyr Ser Leu Ala Leu Thr Arg Ser Ala Leu Asp Glu Arg Ala Val Val	
1475 1480 1485	
ctg ggg tcg gac cgt gaa acg ttg ttg tgc ggt gtg aaa gcg ctg tct	4512
Leu Gly Ser Asp Arg Glu Thr Leu Leu Cys Gly Val Lys Ala Leu Ser	
1490 1495 1500	
gcc ggt cat gag gct tct ggg ttg gtg acc gga tct gtg ggg gct ggg	4560
Ala Gly His Glu Ala Ser Gly Leu Val Thr Gly Ser Val Gly Ala Gly	
1505 1510 1515 1520	
ggc cgc atc ggg ttt gtg ttt tcc ggt cag ggt ggt cag tgg ctg ggg	4608
Gly Arg Ile Gly Phe Val Phe Ser Gly Gln Gly Gly Gln Trp Leu Gly	
1525 1530 1535	
atg ggc cgg ggg ctt tac cgg gct ttt ccg gtg ttc gct gct gcc ttt	4656
Met Gly Arg Gly Leu Tyr Arg Ala Phe Pro Val Phe Ala Ala Ala Phe	
1540 1545 1550	
gac gaa gct tgt gcc gag ctg gat gcg cat ctg ggc cag gaa atc ggg	4704
Asp Glu Ala Cys Ala Glu Leu Asp Ala His Leu Gly Gln Glu Ile Gly	
1555 1560 1565	
gtt cgg gag gtg gtg tcc ggt tcg gat gcg cag ttg ctg gat cgg acg	4752
Val Arg Glu Val Val Ser Gly Ser Asp Ala Gln Leu Leu Asp Arg Thr	
1570 1575 1580	
ttg tgg gcg cag tcg ggt ttg ttc gcg ttg cag gtg ggc ttg ctg aag	4800
Leu Trp Ala Gln Ser Gly Leu Phe Ala Leu Gln Val Gly Leu Leu Lys	
1585 1590 1595 1600	
ttg ctg gat tcg tgg ggg gtt cgg ccg agt gtg gtg ttg ggg cat tcg	4848
Leu Leu Asp Ser Trp Gly Val Arg Pro Ser Val Val Leu Gly His Ser	
1605 1610 1615	
gtg ggc gag ttg gcg gcg gcg ttc gcg gcg ggt gtg gtg tcg ttg tcg	4896
Val Gly Glu Leu Ala Ala Ala Phe Ala Ala Gly Val Val Ser Leu Ser	
1620 1625 1630	

ggt gcg gct cgg ttg gtg gcg ggt cgt gcc cgg ttg atg cag gcg ttg 4944
 Gly Ala Ala Arg Leu Val Ala Gly Arg Ala Arg Leu Met Gln Ala Leu
 1635 1640 1645

ccg tct ggc ggt ggg atg ctg gcg gtg cct gct ggt gag gag ctg ttg 4992
 Pro Ser Gly Gly Gly Met Leu Ala Val Pro Ala Gly Glu Glu Leu Leu
 1650 1655 1660

tgg tcg ttg ttg gcc gat cag ggt gat cgt gtg ggg atc gcc gcg gtc 5040
 Trp Ser Leu Leu Ala Asp Gln Gly Asp Arg Val Gly Ile Ala Ala Val
 1665 1670 1675 1680

aac gct gcg ggg tcg gtg gtg ctc tct ggt gat cgg gat gtg ctc gat 5088
 Asn Ala Ala Gly Ser Val Val Leu Ser Gly Asp Arg Asp Val Leu Asp
 1685 1690 1695

gac ctt gcc ggt cgg ctg gac ggg caa ggg atc cgg tcg agg tgg ttg 5136
 Asp Leu Ala Gly Arg Leu Asp Gly Gln Gly Ile Arg Ser Arg Trp Leu
 1700 1705 1710

cgg gtg tcg cat gcg ttt cat tcg tat cgg atg gat ccg atg ctg gcg 5184
 Arg Val Ser His Ala Phe His Ser Tyr Arg Met Asp Pro Met Leu Ala
 1715 1720 1725

gag ttc gcc gaa ttg gca cga acc gtg gat tac cgg cgt tgt gaa gtg 5232
 Glu Phe Ala Glu Leu Ala Arg Thr Val Asp Tyr Arg Arg Cys Glu Val
 1730 1735 1740

ccg atc gtg tcg acc ttg acc gga gac ctc gat gac gct ggc agg atg 5280
 Pro Ile Val Ser Thr Leu Thr Gly Asp Leu Asp Asp Ala Gly Arg Met
 1745 1750 1755 1760

agc ggg ccc gac tac tgg gtg cgt cag gtg cga gag ccg gtc cgc ttc 5328
 Ser Gly Pro Asp Tyr Trp Val Arg Gln Val Arg Glu Pro Val Arg Phe
 1765 1770 1775

gcc gac ggt gtc cag gcg ctg gtc gag cac gat gtg gcc acc gtt gtc 5376
 Ala Asp Gly Val Gln Ala Leu Val Glu His Asp Val Ala Thr Val Val
 1780 1785 1790

gag ctc ggt ccg gac ggg gcg ttg tcg gcg ctg atc cag gaa tgt gtc 5424
 Glu Leu Gly Pro Asp Gly Ala Leu Ser Ala Leu Ile Gln Glu Cys Val
 1795 1800 1805

gcc gca tcc gat cac gcc ggg cgg ctg agc gcg gtc ccg gcg atg cgc 5472
 Ala Ala Ser Asp His Ala Gly Arg Leu Ser Ala Val Pro Ala Met Arg
 1810 1815 1820

agg aac cag gac gag gcg cag aag gtg atg acg gcc ctg gca cac gtc	5520
Arg Asn Gln Asp Glu Ala Gln Lys Val Met Thr Ala Leu Ala His Val	
1825 1830 1835 1840	
cac gta cgt ggt ggt gcg gtg gac tgg cgg tcg ttc ttc gcc ggt aca	5568
His Val Arg Gly Gly Ala Val Asp Trp Arg Ser Phe Phe Ala Gly Thr	
1845 1850 1855	
agg gcg aag caa atc gag ctg ccc acc tac gcc ttc caa cga cag cgg	5616
Arg Ala Lys Gln Ile Glu Leu Pro Thr Tyr Ala Phe Gln Arg Gln Arg	
1860 1865 1870	
tac tgg ctg aac gcg ctg cgt gaa tct tcc gcc ggc gac atg ggc agg	5664
Tyr Trp Leu Asn Ala Leu Arg Glu Ser Ser Ala Gly Asp Met Gly Arg	
1875 1880 1885	
cgt gtc gaa gcg aag ttc tgg ggc gcc gtc gag cac gaa gat gtg gaa	5712
Arg Val Glu Ala Lys Phe Trp Gly Ala Val Glu His Glu Asp Val Glu	
1890 1895 1900	
tcg ctt gca cgc gta ttg ggc att gtg gac gac ggc gct gct gtg gat	5760
Ser Leu Ala Arg Val Leu Gly Ile Val Asp Asp Gly Ala Ala Val Asp	
1905 1910 1915 1920	
tcc ctg aga agc gcc ctt ccg gtg ttg gcc ggt tgg cag cga acc cgc	5808
Ser Leu Arg Ser Ala Leu Pro Val Leu Ala Gly Trp Gln Arg Thr Arg	
1925 1930 1935	
acc acc gag tcc att atg gat cag cgg tgt tac cga att ggc tgg cgg	5856
Thr Thr Glu Ser Ile Met Asp Gln Arg Cys Tyr Arg Ile Gly Trp Arg	
1940 1945 1950	
cag gta gcc gga ctc ccg ccg atg gga act gtt ttc ggt acc tgg ctg	5904
Gln Val Ala Gly Leu Pro Pro Met Gly Thr Val Phe Gly Thr Trp Leu	
1955 1960 1965	
gtc ttc gcg cct cat ggc tgg tcc agc gaa ccg gag gtg gtg gac tgc	5952
Val Phe Ala Pro His Gly Trp Ser Ser Glu Pro Glu Val Val Asp Cys	
1970 1975 1980	
gtt acg gca ctg cgg gca cgt ggt gcc tcg gtg gtg ttg gtg gaa gct	6000
Val Thr Ala Leu Arg Ala Arg Gly Ala Ser Val Val Leu Val Glu Ala	
1985 1990 1995 2000	
gat ccc gac ccg acc tcc ttc ggc gac cgg gta cga acc ctg tgt tcg	6048
Asp Pro Asp Pro Thr Ser Phe Gly Asp Arg Val Arg Thr Leu Cys Ser	
2005 2010 2015	

ggc ctt ccg gat ctt gtt ggc gtg ttg tca atg ttg tgc ttg gaa gaa 6096
 Gly Leu Pro Asp Leu Val Gly Val Leu Ser Met Leu Cys Leu Glu Glu
 2020 2025 2030

tcg gtc ctt ccg gga ttt tct gcg gtg tca cgg ggt ttt gcg ttg acc 6144
 Ser Val Leu Pro Gly Phe Ser Ala Val Ser Arg Gly Phe Ala Leu Thr
 2035 2040 2045

gtg gag ttg gtg cgg gtt ttg cgg gca gct ggt gcg act gcc cgg ttg 6192
 Val Glu Leu Val Arg Val Leu Arg Ala Ala Gly Ala Thr Ala Arg Leu
 2050 2055 2060

tgg ttg ctg acg tgt ggt ggc gtg tcg gtg gga gat gta ccg gtt cgt 6240
 Trp Leu Leu Thr Cys Gly Gly Val Ser Val Gly Asp Val Pro Val Arg
 2065 2070 2075 2080

cca gcg cag gcc ctg gcg tgg ggg ttg ggg cgt gtt gtg ggg ttg gag 6288
 Pro Ala Gln Ala Leu Ala Trp Gly Leu Gly Arg Val Val Gly Leu Glu
 2085 2090 2095

cat ccg gac tgg tgg ggc ggc ttg atc gat att ccg gtc ttg ttc gac 6336
 His Pro Asp Trp Trp Gly Gly Leu Ile Asp Ile Pro Val Leu Phe Asp
 2100 2105 2110

gaa gac gct caa gag cgg ttg tcg att gtg ctg gca ggt ctc gat gag 6384
 Glu Asp Ala Gln Glu Arg Leu Ser Ile Val Leu Ala Gly Leu Asp Glu
 2115 2120 2125

gac gag gtc gcg atc cgt cct gac ggc atg ttc gcg cgt cgg ttg gta 6432
 Asp Glu Val Ala Ile Arg Pro Asp Gly Met Phe Ala Arg Arg Leu Val
 2130 2135 2140

cgc cac act gtc tca gct gat gtg aag aag gcg tgg cgc ccc agg gga 6480
 Arg His Thr Val Ser Ala Asp Val Lys Lys Ala Trp Arg Pro Arg Gly
 2145 2150 2155 2160

tcg gtg ctg gtg acg ggc ggc acg ggt ggt ttg ggg gcg cac gtt gct 6528
 Ser Val Leu Val Thr Gly Gly Thr Gly Gly Leu Gly Ala His Val Ala
 2165 2170 2175

cgc tgg ctg gcc gac gcc gga gcc gaa cat gtg gcg atg gtg agt cga 6576
 Arg Trp Leu Ala Asp Ala Gly Ala Glu His Val Ala Met Val Ser Arg
 2180 2185 2190

cgc ggc gag cag gca ccg agt gct gag aag ttg cgg acg gaa ctg gag 6624
 Arg Gly Glu Gln Ala Pro Ser Ala Glu Lys Leu Arg Thr Glu Leu Glu
 2195 2200 2205

gat ctg ggt acc cgg gtg tcg atc gtg tca tgc gat gtg acc gat cgc	6672
Asp Leu Gly Thr Arg Val Ser Ile Val Ser Cys Asp Val Thr Asp Arg	
2210 2215 2220	
gag gcg ctc gcc gaa gtg ctg aaa gcc ctt ccg gct gaa aac ccg ttg	6720
Glu Ala Leu Ala Glu Val Leu Lys Ala Leu Pro Ala Glu Asn Pro Leu	
2225 2230 2235 2240	
acc gcg gta gtg cat gcg gca ggc gtg atc gag act ggt gat gcg gcg	6768
Thr Ala Val Val His Ala Ala Gly Val Ile Glu Thr Gly Asp Ala Ala	
2245 2250 2255	
gca atg agc ctg gct gat ttc gat cac gtg ttg tcc gca aag gtg gcc	6816
Ala Met Ser Leu Ala Asp Phe Asp His Val Leu Ser Ala Lys Val Ala	
2260 2265 2270	
ggt gcc gcg aat ctg gat gcc ttg ttg gcc gat gtg gaa ttg gac gcg	6864
Gly Ala Ala Asn Leu Asp Ala Leu Leu Ala Asp Val Glu Leu Asp Ala	
2275 2280 2285	
ttc gtc ttg ttc tca tcg gtg tca gga gtt tgg ggc gct ggg gga cac	6912
Phe Val Leu Phe Ser Ser Val Ser Gly Val Trp Gly Ala Gly Gly His	
2290 2295 2300	
ggg gct tac gca gcg gcg aat gcc tat ctg gat gcg ctc gcg gaa cag	6960
Gly Ala Tyr Ala Ala Ala Asn Ala Tyr Leu Asp Ala Leu Ala Glu Gln	
2305 2310 2315 2320	
cgt cgg tcg cga ggg ctg gtc gcg act gcg gtg gcc tgg ggg ccg tgg	7008
Arg Arg Ser Arg Gly Leu Val Ala Thr Ala Val Ala Trp Gly Pro Trp	
2325 2330 2335	
gcc ggc gag ggc atg gcc tcc gga gaa aca gga gac cag ctg cgc cga	7056
Ala Gly Glu Gly Met Ala Ser Gly Glu Thr Gly Asp Gln Leu Arg Arg	
2340 2345 2350	
tac ggc ctt tcc cca atg gct ccg cag cac gcc atc gcc gga atc cgg	7104
Tyr Gly Leu Ser Pro Met Ala Pro Gln His Ala Ile Ala Gly Ile Arg	
2355 2360 2365	
cag gcc gtg gaa cag gac gaa att tcc ctg gta gtg gcc gat gtc gat	7152
Gln Ala Val Glu Gln Asp Glu Ile Ser Leu Val Val Ala Asp Val Asp	
2370 2375 2380	
tgg gca cgt ttc agc gcg gga ttg ctg gcg gct agg ccg cgg ccg ctg	7200
Trp Ala Arg Phe Ser Ala Gly Leu Leu Ala Ala Arg Pro Arg Pro Leu	
2385 2390 2395 2400	

ctg aac gaa ctg gcc gag gtc aag gaa ctc ctc gtc gat gcc cag ccc 7248
 Leu Asn Glu Leu Ala Glu Val Lys Glu Leu Leu Val Asp Ala Gln Pro
 2405 2410 2415

gag gcg gga gtc ctt gcc gac gcg tcg ttg gaa tgg cgg cag cga ttg 7296
 Glu Ala Gly Val Leu Ala Asp Ala Ser Leu Glu Trp Arg Gln Arg Leu
 2420 2425 2430

tcc gcg gca ccg agg ccg aca cag gaa cag ctg atc ctg gag ctg gta 7344
 Ser Ala Ala Pro Arg Pro Thr Gln Glu Gln Leu Ile Leu Glu Leu Val
 2435 2440 2445

cgc ggc gaa acc gct ctg gtg ctg gga cac ccc ggg gca gcg gcc gtt 7392
 Arg Gly Glu Thr Ala Leu Val Leu Gly His Pro Gly Ala Ala Ala Val
 2450 2455 2460

gca tcg gaa cga gcc ttc aag gac agc gga ttc gac tcg cag gcc gcg 7440
 Ala Ser Glu Arg Ala Phe Lys Asp Ser Gly Phe Asp Ser Gln Ala Ala
 2465 2470 2475 2480

gtc gaa ctc cgc gtt cgg ctc aat cga gct acc ggc ctc cag ttg cca 7488
 Val Glu Leu Arg Val Arg Leu Asn Arg Ala Thr Gly Leu Gln Leu Pro
 2485 2490 2495

tcg aca att atc ttc agc cat ccc acg cct gcg gaa ctg gct gcg gag 7536
 Ser Thr Ile Ile Phe Ser His Pro Thr Pro Ala Glu Leu Ala Ala Glu
 2500 2505 2510

ctg cgg gcg agg ctt ctt ccc gag tcc gca gga gca ggc att ccc gag 7584
 Leu Arg Ala Arg Leu Leu Pro Glu Ser Ala Gly Ala Gly Ile Pro Glu
 2515 2520 2525

gag gac gag gcg cga atc aga gcg gca ctg acg tcg atc ccg ttc ccg 7632
 Glu Asp Glu Ala Arg Ile Arg Ala Ala Leu Thr Ser Ile Pro Phe Pro
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gcc ttg cgc gag gca ggc ttg gtg agt ccg ctg ctc gca ctt gcc gga 7680
 Ala Leu Arg Glu Ala Gly Leu Val Ser Pro Leu Leu Ala Leu Ala Gly
 2545 2550 2555 2560

cac ccg gtc gac tcc ggt atc tcc tcg gac gat gcg gcc gcg acc tcg 7728
 His Pro Val Asp Ser Gly Ile Ser Ser Asp Asp Ala Ala Ala Thr Ser
 2565 2570 2575

atc gat gcg atg gat gta gcc ggc ctc gtc gaa gca gcg ctg ggc gaa 7776
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Arg Glu Ser
2595

7788

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Gly Thr Asp Ala Ile Thr Thr Val Pro Glu Gly Arg Trp Gly Asp Pro
35 40 45
Leu Pro Gly Arg Asp Ala Pro Lys Gly Pro Glu Trp Gly Gly Phe Leu
50 55 60
Ala Asp Val Asp Cys Phe Asp Pro Glu Phe Phe Gly Ile Ser Pro Arg
65 70 75 80
Glu Ala Ala Ala Val Asp Pro Gln Gln Arg Leu Ala Leu Glu Leu Ala
85 90 95
Trp Glu Ala Leu Glu Asp Ala Gly Ile Pro Ala Gly Glu Leu Arg Gly
100 105 110
Thr Ala Ala Gly Val Phe Met Gly Ala Ile Ser Asp Asp Tyr Ala Ala
115 120 125
Leu Leu Arg Glu Ser Pro Pro Glu Val Ala Ala Gln Tyr Arg Leu Thr
130 135 140
Gly Thr His Arg Ser Leu Ile Ala Asn Arg Val Ser Tyr Val Leu Gly
145 150 155 160
Leu Arg Gly Pro Ser Leu Thr Val Asp Ser Gly Gln Ser Ser Ser Leu
165 170 175
Val Gly Val His Leu Ala Ser Glu Ser Leu Arg Arg Gly Glu Cys Thr
180 185 190

Ile Ala Leu Ala Gly Gly Val Asn Leu Asn Leu Ala Ala Glu Ser Asn
 195 200 205
 Ser Ala Leu Met Asp Phe Gly Ala Leu Ser Pro Asp Gly Arg Cys Phe
 210 215 220
 Thr Phe Asp Val Arg Ala Asn Gly Tyr Val Arg Gly Glu Gly Gly Gly
 225 230 235 240
 Leu Val Val Leu Lys Lys Ala Asp Gln Ala His Ala Asp Gly Asp Arg
 245 250 255
 Ile Tyr Cys Leu Ile Arg Gly Ser Ala Val Asn Asn Asp Gly Gly Gly
 260 265 270
 Ala Gly Leu Thr Val Pro Ala Ala Asp Ala Gln Ala Glu Leu Leu Arg
 275 280 285
 Gln Ala Tyr Arg Asn Ala Gly Val Asp Pro Ala Ala Val Gln Tyr Val
 290 295 300
 Glu Leu His Gly Ser Ala Thr Arg Val Gly Asp Pro Val Glu Ala Ala
 305 310 315 320
 Ala Leu Gly Ala Val Leu Gly Ala Ala Arg Arg Pro Gly Asp Glu Leu
 325 330 335
 Arg Val Gly Ser Ala Lys Thr Asn Val Gly His Leu Glu Ala Ala Ala
 340 345 350
 Gly Val Thr Gly Leu Leu Lys Thr Ala Leu Ser Ile Trp His Arg Glu
 355 360 365
 Leu Pro Pro Ser Leu His Phe Thr Ala Pro Asn Pro Glu Ile Pro Leu
 370 375 380
 Asp Glu Leu Asn Leu Arg Val Gln Arg Asp Leu Arg Pro Trp Pro Glu
 385 390 395 400
 Ser Glu Gly Pro Leu Leu Ala Gly Val Ser Ala Phe Gly Met Gly Gly
 405 410 415
 Thr Asn Cys His Leu Val Leu Ser Gly Thr Ser Arg Val Glu Arg Arg
 420 425 430
 Arg Ser Gly Pro Ala Glu Ala Thr Met Pro Trp Val Leu Ser Ala Arg
 435 440 445

Thr Pro Val Ala Leu Arg Ala Gln Ala Ala Arg Leu His Thr His Leu
 450 455 460

Asn Thr Ala Gly Gln Ser Pro Leu Asp Val Ala Tyr Ser Leu Ala Thr
 465 470 475 480

Thr Arg Ser Ala Leu Pro His Arg Ala Ala Leu Val Ala Asp Asp Glu
 485 490 495

Pro Lys Leu Leu Ala Gly Leu Lys Ala Leu Ala Asp Gly Asp Asp Ala
 500 505 510

Pro Thr Leu Cys His Gly Ala Thr Ser Gly Glu Arg Ala Ala Val Phe
 515 520 525

Val Phe Pro Gly Gln Gly Ser Gln Trp Ile Gly Met Gly Arg Gln Leu
 530 535 540

Leu Glu Thr Ser Glu Val Phe Ala Ala Ser Met Ser Asp Cys Ala Asp
 545 550 555 560

Ala Leu Ala Pro His Leu Asp Trp Ser Leu Leu Asp Val Leu Arg Asn
 565 570 575

Ala Ala Gly Ala Ala His Leu Asp His Asp Asp Val Val Gln Pro Ala
 580 585 590

Leu Phe Ala Ile Met Val Ser Leu Ala Glu Leu Trp Arg Ser Trp Gly
 595 600 605

Val Arg Pro Val Ala Val Val Gly His Ser Gln Gly Glu Ile Ala Ala
 610 615 620

Ala Cys Val Ala Gly Ala Leu Ser Val Arg Asp Ala Ala Arg Val Val
 625 630 635 640

Ala Val Arg Ser Arg Leu Leu Thr Ala Leu Ala Gly Ser Gly Ala Met
 645 650 655

Ala Ser Leu Gln His Pro Ala Glu Glu Val Arg Gln Ile Leu Leu Pro
 660 665 670

Trp Arg Asp Arg Ile Gly Val Ala Gly Val Asn Gly Pro Ser Ser Thr
 675 680 685

Leu Val Ser Gly Asp Arg Glu Ala Met Ala Glu Leu Leu Ala Glu Cys
 690 695 700

Ala Asp Arg Glu Leu Arg Met Arg Arg Ile Pro Val Glu Tyr Ala Ser
 705 710 715 720

His Ser Pro His Ile Glu Val Val Arg Asp Glu Leu Leu Gly Leu Leu
 725 730 735

Ala Pro Val Glu Pro Arg Thr Gly Ser Ile Pro Ile Tyr Ser Thr Thr
 740 745 750

Thr Gly Asp Leu Leu Asp Arg Pro Met Asp Ala Asp Tyr Trp Tyr Arg
 755 760 765

Asn Leu Arg Gln Pro Val Leu Phe Glu Ala Ala Val Glu Ala Leu Leu
 770 775 780

Lys Arg Gly Tyr Asp Ala Phe Ile Glu Ile Ser Pro His Pro Val Leu
 785 790 795 800

Thr Ala Asn Ile Gln Glu Thr Ala Val Arg Ala Gly Arg Glu Val Val
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Ala Leu Gly Thr Leu Arg Arg Gly Glu Gly Gly Met Arg Gln Ala Leu
 820 825 830

Thr Ser Leu Ala Arg Ala His Val His Gly Val Ala Ala Asp Trp His
 835 840 845

Ala Val Phe Ala Gly Thr Gly Ala Gln Arg Val Asp Leu Pro Thr Tyr
 850 855 860

Ala Phe Gln Arg Gln Arg Tyr Trp Leu Asp Ala Lys Leu Pro Asp Val
 865 870 875 880

Ala Met Pro Glu Ser Asp Val Ser Thr Ala Leu Arg Glu Lys Leu Arg
 885 890 895

Ser Ser Pro Arg Ala Asp Val Asp Ser Thr Thr Leu Thr Met Ile Arg
 900 905 910

Ala Gln Ala Ala Val Val Leu Gly His Ser Asp Pro Lys Glu Val Asp
 915 920 925

Pro Asp Arg Thr Phe Lys Asp Leu Gly Phe Asp Ser Ser Met Val Val
 930 935 940

Glu Leu Cys Asp Arg Leu Asn Ala Ala Thr Gly Leu Arg Leu Ala Pro
 945 950 955 960

Ser Val Val Phe Asp Cys Pro Thr Pro Asp Lys Leu Ala Arg Gln Val
 965 970 975
 Arg Thr Leu Leu Leu Gly Glu Pro Ala Pro Met Thr Ser His Arg Pro
 980 985 990
 Asp Ser Asp Ala Asp Glu Pro Ile Ala Val Ile Gly Met Gly Cys Arg
 995 1000 1005
 Phe Pro Gly Gly Val Ser Ser Pro Glu Glu Leu Trp Gln Leu Val Ala
 1010 1015 1020
 Ala Gly Arg Asp Val Val Ser Glu Phe Pro Ala Asp Arg Gly Trp Asp
 1025 1030 1035 1040
 Leu Glu Arg Ala Gly Thr Ser His Val Arg Ala Gly Gly Phe Leu His
 1045 1050 1055
 Gly Ala Pro Asp Phe Asp Pro Gly Phe Phe Arg Ile Ser Pro Arg Glu
 1060 1065 1070
 Ala Leu Ala Met Asp Pro Gln Gln Arg Leu Leu Leu Glu Ile Ala Trp
 1075 1080 1085
 Glu Ala Val Glu Arg Gly Gly Ile Asn Pro Gln His Leu His Gly Ser
 1090 1095 1100
 Gln Thr Gly Val Phe Val Gly Ala Thr Ser Leu Asp Tyr Gly Pro Arg
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 Leu His Glu Ala Ser Glu Glu Ala Ala Gly Tyr Val Leu Thr Gly Ser
 1125 1130 1135
 Thr Thr Ser Val Ala Ser Gly Arg Val Ala Tyr Ser Phe Gly Phe Glu
 1140 1145 1150
 Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala
 1155 1160 1165
 Leu His Leu Ala Cys Gln Ser Leu Arg Ser Gly Glu Cys Asp Leu Ala
 1170 1175 1180
 Leu Ala Gly Gly Val Thr Val Met Ala Thr Pro Gly Met Phe Val Glu
 1185 1190 1195 1200
 Phe Ser Arg Gln Arg Gly Leu Ala Pro Asp Gly Arg Cys Lys Ser Phe
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Ala Glu Ala Ala Asp Gly Thr Gly Trp Ser Glu Gly Ala Gly Leu Val
 1220 1225 1230
 Leu Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly His Glu Val Leu
 1235 1240 1245
 Ala Val Val Arg Gly Ser Ala Val Asn Gln Asp Gly Ala Ser Asn Gly
 1250 1255 1260
 Leu Thr Ala Pro Asn Gly Ser Ser Gln Gln Arg Val Ile Ala Gln Ala
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 Leu Ala Ser Ala Gly Leu Ser Val Ser Asp Val Asp Ala Val Glu Ala
 1285 1290 1295
 His Gly Thr Gly Thr Arg Leu Gly Asp Pro Ile Glu Ala Gln Ala Leu
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 Ile Ala Thr Tyr Gly Gln Gly Arg Leu Pro Glu Arg Pro Leu Trp Leu
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 Gly Ser Met Lys Ser Asn Ile Gly His Ala Gln Ala Ala Ala Gly Ile
 1330 1335 1340
 Ala Gly Val Met Lys Met Val Met Ala Met Arg His Gly Gln Leu Pro
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 Arg Thr Leu His Val Asp Glu Pro Thr Ser Gly Val Asp Trp Ser Ala
 1365 1370 1375
 Gly Thr Val Gln Leu Leu Thr Glu Asn Thr Pro Trp Pro Gly Ser Gly
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 Gly Pro Gly Ser Gly Ser Val Val Asp Val Pro Val Val Pro Trp Met
 1425 1430 1435 1440
 Val Ser Gly Lys Thr Pro Glu Ala Leu Ser Ala Gln Ala Thr Ala Leu
 1445 1450 1455
 Met Thr Tyr Leu Asp Glu Arg Pro Asp Val Ser Ser Leu Asp Val Gly
 1460 1465 1470

Tyr Ser Leu Ala Leu Thr Arg Ser Ala Leu Asp Glu Arg Ala Val Val
1475 1480 1485

Leu Gly Ser Asp Arg Glu Thr Leu Leu Cys Gly Val Lys Ala Leu Ser
1490 1495 1500

Ala Gly His Glu Ala Ser Gly Leu Val Thr Gly Ser Val Gly Ala Gly
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Gly Arg Ile Gly Phe Val Phe Ser Gly Gln Gly Gly Gln Trp Leu Gly
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Met Gly Arg Gly Leu Tyr Arg Ala Phe Pro Val Phe Ala Ala Ala Phe
1540 1545 1550

Asp Glu Ala Cys Ala Glu Leu Asp Ala His Leu Gly Gln Glu Ile Gly
1555 1560 1565

Val Arg Glu Val Val Ser Gly Ser Asp Ala Gln Leu Leu Asp Arg Thr
1570 1575 1580

Leu Trp Ala Gln Ser Gly Leu Phe Ala Leu Gln Val Gly Leu Leu Lys
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Leu Leu Asp Ser Trp Gly Val Arg Pro Ser Val Val Leu Gly His Ser
1605 1610 1615

Val Gly Glu Leu Ala Ala Ala Phe Ala Ala Gly Val Val Ser Leu Ser
1620 1625 1630

Gly Ala Ala Arg Leu Val Ala Gly Arg Ala Arg Leu Met Gln Ala Leu
1635 1640 1645

Pro Ser Gly Gly Gly Met Leu Ala Val Pro Ala Gly Glu Glu Leu Leu
1650 1655 1660

Trp Ser Leu Leu Ala Asp Gln Gly Asp Arg Val Gly Ile Ala Ala Val
665 1670 1675 1680

Asn Ala Ala Gly Ser Val Val Leu Ser Gly Asp Arg Asp Val Leu Asp
1685 1690 1695

Asp Leu Ala Gly Arg Leu Asp Gly Gln Gly Ile Arg Ser Arg Trp Leu
1700 1705 1710

Arg Val Ser His Ala Phe His Ser Tyr Arg Met Asp Pro Met Leu Ala
1715 1720 1725

Glu Phe Ala Glu Leu Ala Arg Thr Val Asp Tyr Arg Arg Cys Glu Val
 1730 1735 1740

Pro Ile Val Ser Thr Leu Thr Gly Asp Leu Asp Asp Ala Gly Arg Met
 745 1750 1755 1760

Ser Gly Pro Asp Tyr Trp Val Arg Gln Val Arg Glu Pro Val Arg Phe
 1765 1770 1775

Ala Asp Gly Val Gln Ala Leu Val Glu His Asp Val Ala Thr Val Val
 1780 1785 1790

Glu Leu Gly Pro Asp Gly Ala Leu Ser Ala Leu Ile Gln Glu Cys Val
 1795 1800 1805

Ala Ala Ser Asp His Ala Gly Arg Leu Ser Ala Val Pro Ala Met Arg
 1810 1815 1820

Arg Asn Gln Asp Glu Ala Gln Lys Val Met Thr Ala Leu Ala His Val
 825 1830 1835 1840

His Val Arg Gly Gly Ala Val Asp Trp Arg Ser Phe Phe Ala Gly Thr
 1845 1850 1855

Arg Ala Lys Gln Ile Glu Leu Pro Thr Tyr Ala Phe Gln Arg Gln Arg
 1860 1865 1870

Tyr Trp Leu Asn Ala Leu Arg Glu Ser Ser Ala Gly Asp Met Gly Arg
 1875 1880 1885

Arg Val Glu Ala Lys Phe Trp Gly Ala Val Glu His Glu Asp Val Glu
 1890 1895 1900

Ser Leu Ala Arg Val Leu Gly Ile Val Asp Asp Gly Ala Ala Val Asp
 905 1910 1915 1920

Ser Leu Arg Ser Ala Leu Pro Val Leu Ala Gly Trp Gln Arg Thr Arg
 1925 1930 1935

Thr Thr Glu Ser Ile Met Asp Gln Arg Cys Tyr Arg Ile Gly Trp Arg
 1940 1945 1950

Gln Val Ala Gly Leu Pro Pro Met Gly Thr Val Phe Gly Thr Trp Leu
 1955 1960 1965

Val Phe Ala Pro His Gly Trp Ser Ser Glu Pro Glu Val Val Asp Cys
 1970 1975 1980

Val Thr Ala Leu Arg Ala Arg Gly Ala Ser Val Val Leu Val Glu Ala
 985 1990 1995 2000
 Asp Pro Asp Pro Thr Ser Phe Gly Asp Arg Val Arg Thr Leu Cys Ser
 2005 2010 2015
 Gly Leu Pro Asp Leu Val Gly Val Leu Ser Met Leu Cys Leu Glu Glu
 2020 2025 2030
 Ser Val Leu Pro Gly Phe Ser Ala Val Ser Arg Gly Phe Ala Leu Thr
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 Val Glu Leu Val Arg Val Leu Arg Ala Ala Gly Ala Thr Ala Arg Leu
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 Trp Leu Leu Thr Cys Gly Gly Val Ser Val Gly Asp Val Pro Val Arg
 065 2070 2075 2080
 Pro Ala Gln Ala Leu Ala Trp Gly Leu Gly Arg Val Val Gly Leu Glu
 2085 2090 2095
 His Pro Asp Trp Trp Gly Gly Leu Ile Asp Ile Pro Val Leu Phe Asp
 2100 2105 2110
 Glu Asp Ala Gln Glu Arg Leu Ser Ile Val Leu Ala Gly Leu Asp Glu
 2115 2120 2125
 Asp Glu Val Ala Ile Arg Pro Asp Gly Met Phe Ala Arg Arg Leu Val
 2130 2135 2140
 Arg His Thr Val Ser Ala Asp Val Lys Lys Ala Trp Arg Pro Arg Gly
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 Ser Val Leu Val Thr Gly Gly Thr Gly Gly Leu Gly Ala His Val Ala
 2165 2170 2175
 Arg Trp Leu Ala Asp Ala Gly Ala Glu His Val Ala Met Val Ser Arg
 2180 2185 2190
 Arg Gly Glu Gln Ala Pro Ser Ala Glu Lys Leu Arg Thr Glu Leu Glu
 2195 2200 2205
 Asp Leu Gly Thr Arg Val Ser Ile Val Ser Cys Asp Val Thr Asp Arg
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 Glu Ala Leu Ala Glu Val Leu Lys Ala Leu Pro Ala Glu Asn Pro Leu
 225 2230 2235 2240

Thr Ala Val Val His Ala Ala Gly Val Ile Glu Thr Gly Asp Ala Ala
2245 2250 2255

Ala Met Ser Leu Ala Asp Phe Asp His Val Leu Ser Ala Lys Val Ala
2260 2265 2270

Gly Ala Ala Asn Leu Asp Ala Leu Leu Ala Asp Val Glu Leu Asp Ala
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Phe Val Leu Phe Ser Ser Val Ser Gly Val Trp Gly Ala Gly Gly His
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Gly Ala Tyr Ala Ala Ala Asn Ala Tyr Leu Asp Ala Leu Ala Glu Gln
305 2310 2315 2320

Arg Arg Ser Arg Gly Leu Val Ala Thr Ala Val Ala Trp Gly Pro Trp
2325 2330 2335

Ala Gly Glu Gly Met Ala Ser Gly Glu Thr Gly Asp Gln Leu Arg Arg
2340 2345 2350

Tyr Gly Leu Ser Pro Met Ala Pro Gln His Ala Ile Ala Gly Ile Arg
2355 2360 2365

Gln Ala Val Glu Gln Asp Glu Ile Ser Leu Val Val Ala Asp Val Asp
2370 2375 2380

Trp Ala Arg Phe Ser Ala Gly Leu Leu Ala Ala Arg Pro Arg Pro Leu
385 2390 2395 2400

Leu Asn Glu Leu Ala Glu Val Lys Glu Leu Leu Val Asp Ala Gln Pro
2405 2410 2415

Glu Ala Gly Val Leu Ala Asp Ala Ser Leu Glu Trp Arg Gln Arg Leu
2420 2425 2430

Ser Ala Ala Pro Arg Pro Thr Gln Glu Gln Leu Ile Leu Glu Leu Val
2435 2440 2445

Arg Gly Glu Thr Ala Leu Val Leu Gly His Pro Gly Ala Ala Ala Val
2450 2455 2460

Ala Ser Glu Arg Ala Phe Lys Asp Ser Gly Phe Asp Ser Gln Ala Ala
465 2470 2475 2480

Val Glu Leu Arg Val Arg Leu Asn Arg Ala Thr Gly Leu Gln Leu Pro
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Ser Thr Ile Ile Phe Ser His Pro Thr Pro Ala Glu Leu Ala Ala Glu
 2500 2505 2510

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 2515 2520 2525

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His Pro Val Asp Ser Gly Ile Ser Ser Asp Asp Ala Ala Ala Thr Ser
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Arg Glu Ser
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gcg gag aag gac gat ccc atc gcg atc gtg gcg atg agt tgt cgt tat 144
 Ala Glu Lys Asp Asp Pro Ile Ala Ile Val Ala Met Ser Cys Arg Tyr
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 Pro Gly Gln Val Ser Ser Pro Glu Asp Leu Trp Gln Leu Ala Ala Gly

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Gly Val Asp Ala Ile Ser Glu Val Pro Gly Asp Arg Gly Trp Asp Leu			
65	70	75	80
gat ggc gtg ttc gtt ccg gac tcc gat cgt cct ggc acg tcg tat gcc			288
Asp Gly Val Phe Val Pro Asp Ser Asp Arg Pro Gly Thr Ser Tyr Ala			
	85	90	95
tgc gcg ggc ggt ttt ctt cag ggc gtg tcg gag ttc gac gcg ggt ttc			336
Cys Ala Gly Gly Phe Leu Gln Gly Val Ser Glu Phe Asp Ala Gly Phe			
	100	105	110
ttc ggg att tcg ccg cgt gag gcg ctg gcg atg gat ccg cag cag cgg			384
Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg			
	115	120	125
ttg ctg ctg gaa gtc gcg tgg gag gtc ttc gag cgg gct ggg ctg gag			432
Leu Leu Leu Glu Val Ala Trp Glu Val Phe Glu Arg Ala Gly Leu Glu			
	130	135	140
cag cgg tcg aca cgc ggt tcc cgc gtt ggc gtg ttc gtc ggc acc aat			480
Gln Arg Ser Thr Arg Gly Ser Arg Val Gly Val Phe Val Gly Thr Asn			
145	150	155	160
ggc cag gac tac gcg tcg tgg ttg cgg acg ccg ccg cct gcg gtg gca			528
Gly Gln Asp Tyr Ala Ser Trp Leu Arg Thr Pro Pro Pro Ala Val Ala			
	165	170	175
ggt cat gtg ctg acg ggc ggt gcg gca gcg gtt ctt tcg ggc cgg gtt			576
Gly His Val Leu Thr Gly Gly Ala Ala Ala Val Leu Ser Gly Arg Val			
	180	185	190
gcg tat tcg ttc ggg ttc gag ggt cct gcg gtg acg gtg gat acg gcg			624
Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala			
	195	200	205
tgt tcg tcg tcg ttg gtg gcg ttg cac ctg gcg ggg caa gca ctg cgg			672
Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ala Leu Arg			
	210	215	220
gcc ggt gag tgc gac ctt gcc ctt gcc ggt ggc gtc acg gtg atg tcg			720
Ala Gly Glu Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met Ser			
225	230	235	240
acg ccg aag gtg ttc ctg gag ttc tcc cgc caa cgg ggt ctc gcg ccg			768
Thr Pro Lys Val Phe Leu Glu Phe Ser Arg Gln Arg Gly Leu Ala Pro			

245	250	255	
gat ggg cgg tgc aag tcg ttc gcg gcg ggt gcg gat ggc act gga tgg			816
Asp Gly Arg Cys Lys Ser Phe Ala Ala Gly Ala Asp Gly Thr Gly Trp			
260	265	270	
ggt gag ggt gcc gga ctg ttg ttg ctg gag cgg ttg tcg gat gcc cgg			864
Gly Glu Gly Ala Gly Leu Leu Leu Leu Glu Arg Leu Ser Asp Ala Arg			
275	280	285	
cgg aat ggg cat gag gtg ctg gcg gtt gtt cgt ggt agt gcg gtg aat			912
Arg Asn Gly His Glu Val Leu Ala Val Val Arg Gly Ser Ala Val Asn			
290	295	300	
cag gac ggt gcg tcg aat ggt ttg acc gcg ccg aat ggt tcg tcg cag			960
Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Ser Ser Gln			
305	310	315	320
cag cgg gtg att acc cag gcg ttg gcg agt gcg ggg ttg tcg gtg tcc			1008
Gln Arg Val Ile Thr Gln Ala Leu Ala Ser Ala Gly Leu Ser Val Ser			
325	330	335	
gat gtg gat gct gtg gag gcg cat ggg acg ggc acg cgg ctt ggt gat			1056
Asp Val Asp Ala Val Glu Ala His Gly Thr Gly Thr Arg Leu Gly Asp			
340	345	350	
ccg atc gag gcg cag gcg ctg atc gcc acc tac ggc cgt gat cgt gat			1104
Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr Gly Arg Asp Arg Asp			
355	360	365	
cct ggc cgg ccg ttg tgg ttg ggg tcg gtc aag tcg aac atc ggt cat			1152
Pro Gly Arg Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile Gly His			
370	375	380	
acg caa gcg gcg gcg ggt gtg gct ggt gtg atc aag atg gtg atg gcg			1200
Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile Lys Met Val Met Ala			
385	390	395	400
atg cgg cac ggg cag ctg cca cgc acg ttg cac gtg gaa tcg ccg tcg			1248
Met Arg His Gly Gln Leu Pro Arg Thr Leu His Val Glu Ser Pro Ser			
405	410	415	
ccg gag gtg gat tgg tcg gcg ggg acg gtt caa ctc ctt acg gag aac			1296
Pro Glu Val Asp Trp Ser Ala Gly Thr Val Gln Leu Leu Thr Glu Asn			
420	425	430	
acg ccc tgg ccc agg agt ggt cgt gtt cgt cgg gtg ggg gtg tcg tcg			1344
Thr Pro Trp Pro Arg Ser Gly Arg Val Arg Arg Val Gly Val Ser Ser			

435	440	445	
ttc ggg atc agt ggt act aac gcg cac gtc atc ctc gaa cag ccc ccg			1392
Phe Gly Ile Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Pro Pro			
450	455	460	
gga gtg ccg agt cag tct gcg ggg ccg ggt tcg ggt tct gtc gtg gat			1440
Gly Val Pro Ser Gln Ser Ala Gly Pro Gly Ser Gly Ser Val Val Asp			
465	470	475	480
gtt ccg gtg gtg ccg tgg atg gtg tcg ggc aaa aca ccc gaa gcg cta			1488
Val Pro Val Val Pro Trp Met Val Ser Gly Lys Thr Pro Glu Ala Leu			
485	490	495	
tcc gcg cag gca acg gcg ttg atg acc tat ctg gac gag cga cct gat			1536
Ser Ala Gln Ala Thr Ala Leu Met Thr Tyr Leu Asp Glu Arg Pro Asp			
500	505	510	
gtc tcc tcg ctg gat gtt ggg tac tcg ctg gcg ttg aca cgg tcg gcg			1584
Val Ser Ser Leu Asp Val Gly Tyr Ser Leu Ala Leu Thr Arg Ser Ala			
515	520	525	
ctg gat gag cga gcg gtg gtg ctg ggg tcg gac cgt gaa acg ttg ttg			1632
Leu Asp Glu Arg Ala Val Val Leu Gly Ser Asp Arg Glu Thr Leu Leu			
530	535	540	
tgc ggt gtg aaa gcg ctg tct gcc ggt cat gag gct tct ggg ttg gtg			1680
Cys Gly Val Lys Ala Leu Ser Ala Gly His Glu Ala Ser Gly Leu Val			
545	550	555	560
acc gga tct gtg ggg gct ggg ggc cgc atc ggg ttt gtg ttt tcc ggt			1728
Thr Gly Ser Val Gly Ala Gly Gly Arg Ile Gly Phe Val Phe Ser Gly			
565	570	575	
cag ggt ggt cag tgg ctg ggg atg ggc cgg ggg ctt tac cgg gct ttt			1776
Gln Gly Gly Gln Trp Leu Gly Met Gly Arg Gly Leu Tyr Arg Ala Phe			
580	585	590	
ccg gtg ttc gct gct gcc ttt gac gaa gct tgt gcc gag ctg gat gca			1824
Pro Val Phe Ala Ala Ala Phe Asp Glu Ala Cys Ala Glu Leu Asp Ala			
595	600	605	
cat ctg ggc cag gaa atc ggg gtt cgg gag gtg gtg tcc ggt tcg gat			1872
His Leu Gly Gln Glu Ile Gly Val Arg Glu Val Val Ser Gly Ser Asp			
610	615	620	
gcg cag ttg ctg gat cgg acg ttg tgg gcg cag tcg ggt ttg ttc gcg			1920
Ala Gln Leu Leu Asp Arg Thr Leu Trp Ala Gln Ser Gly Leu Phe Ala			

625	630	635	640	
ttg cag gtg ggc	ttg ctg aag ttg	ctg gat tgc tgg ggg	gtt cgg ccg	1968
Leu Gln Val Gly	Leu Leu Lys Leu	Leu Asp Ser Trp	Gly Val Arg Pro	
	645	650	655	
agt gtg gtg ttg	ggg cat tgc gtg	ggc gag ttg gcg	gcg gcg ttc gcg	2016
Ser Val Val Leu	Gly His Ser Val	Gly Glu Leu Ala	Ala Ala Phe Ala	
	660	665	670	
gcg ggt gtg gtg	tgc ttg tgc ggt	gcg gct cgg ttg	gtg gcg ggt cgt	2064
Ala Gly Val Val	Ser Leu Ser Gly	Ala Ala Arg Leu	Val Ala Gly Arg	
	675	680	685	
gcc cgg ttg atg	cag gcg ttg ccg	tct ggc ggt ggg	atg ctg gcg gtg	2112
Ala Arg Leu Met	Gln Ala Leu Pro	Ser Gly Gly Gly	Met Leu Ala Val	
	690	695	700	
cct gct ggt gag	gag ctg ttg tgg	tgc ttg ttg gcc	gat cag ggt gat	2160
Pro Ala Gly Glu	Glu Leu Leu Trp	Ser Leu Leu Ala	Asp Gln Gly Asp	
	705	710	715	720
cgt gtg ggg atc	gcc gcg gtc aac	gct gcg ggg tgc	gtg gtg ctc tct	2208
Arg Val Gly Ile	Ala Ala Val Asn	Ala Ala Gly Ser	Val Val Leu Ser	
	725	730	735	
ggt gat cgg gat	gtg ctc gat gac	ctt gcc ggt cgg	ctg gac ggg caa	2256
Gly Asp Arg Asp	Val Leu Asp Asp	Leu Ala Gly Arg	Leu Asp Gly Gln	
	740	745	750	
ggg atc cgg tgc	agg tgg ttg ccg	gtg tgc cat gcg	ttt cat tgc tat	2304
Gly Ile Arg Ser	Arg Trp Leu Arg	Val Ser His Ala	Phe His Ser Tyr	
	755	760	765	
cgg atg gat ccg	atg ctg gcg gag	ttc gcc gaa ttg	gca cga acc gtg	2352
Arg Met Asp Pro	Met Leu Ala Glu	Phe Ala Glu Leu	Ala Arg Thr Val	
	770	775	780	
gat tac cgg cgt	tgt gaa gtg ccg	atc gtg tgc acc	ttg acc gga gac	2400
Asp Tyr Arg Arg	Cys Glu Val Pro	Ile Val Ser Thr	Leu Thr Gly Asp	
	785	790	795	800
ctc gat gac gct	ggc agg atg agc	ggg ccc gac tac	tgg gtg cgt cag	2448
Leu Asp Asp Ala	Gly Arg Met Ser	Gly Pro Asp Tyr	Trp Val Arg Gln	
	805	810	815	
gtg cga gag ccg	gtc cgc ttc gcc	gac ggt gtc cag	gcg ctg gtc gag	2496
Val Arg Glu Pro	Val Arg Phe Ala	Asp Gly Val Gln	Ala Leu Val Glu	

820	825	830	
cac gat gtg gcc act gtt gtc gag ctc ggt ccg gac ggg gcg ttg tcg			2544
His Asp Val Ala Thr Val Val Glu Leu Gly Pro Asp Gly Ala Leu Ser			
835	840	845	
gcg ctg atc cag gaa tgt gtc gcc gca tcc gat cac gcc ggg cgg ctg			2592
Ala Leu Ile Gln Glu Cys Val Ala Ala Ser Asp His Ala Gly Arg Leu			
850	855	860	
agc gcg gtc ccg gcg atg cgc agg aac cag gac gag gcg cag aag gtg			2640
Ser Ala Val Pro Ala Met Arg Arg Asn Gln Asp Glu Ala Gln Lys Val			
865	870	875	880
atg acg gcc ctg gca cac gtc cac gta cgt ggt ggt gcg gtg gac tgg			2688
Met Thr Ala Leu Ala His Val His Val Arg Gly Gly Ala Val Asp Trp			
885	890	895	
cgg tcg ttc ttc gcc ggt acg gga gcg aaa caa atc gag ctg ccc acc			2736
Arg Ser Phe Phe Ala Gly Thr Gly Ala Lys Gln Ile Glu Leu Pro Thr			
900	905	910	
tac gcc ttc caa cga cag cgg tac tgg ctg gtg cca tcg gat tcc ggt			2784
Tyr Ala Phe Gln Arg Gln Arg Tyr Trp Leu Val Pro Ser Asp Ser Gly			
915	920	925	
gat gtg aca ggt gcc ggt ctg gcc ggg gcg gag cat ccg ctg ttg ggt			2832
Asp Val Thr Gly Ala Gly Leu Ala Gly Ala Glu His Pro Leu Leu Gly			
930	935	940	
gct gtg gtg ccg gtc gcg ggt ggt gac gag gtg ttg ctg acc ggc agg			2880
Ala Val Val Pro Val Ala Gly Gly Asp Glu Val Leu Leu Thr Gly Arg			
945	950	955	960
att tcg gtg cgg acg cat ccg tgg ctg gcc gaa cac cgg gtg ctg ggt			2928
Ile Ser Val Arg Thr His Pro Trp Leu Ala Glu His Arg Val Leu Gly			
965	970	975	
gaa gtg atc gtt gcg ggc acc gcg ttg ctg gag atc gcc ttg cac gcg			2976
Glu Val Ile Val Ala Gly Thr Ala Leu Leu Glu Ile Ala Leu His Ala			
980	985	990	
ggg gaa cgt ctt ggt tgt gaa cgg gtg gaa gag ctc acc ctg gaa gca			3024
Gly Glu Arg Leu Gly Cys Glu Arg Val Glu Glu Leu Thr Leu Glu Ala			
995	1000	1005	
ccg ctg gtc ctg ccg gag cgc ggg gcg atc cag gtt cag ctg cga gtg			3072
Pro Leu Val Leu Pro Glu Arg Gly Ala Ile Gln Val Gln Leu Arg Val			

1010	1015	1020	
ggc gcg ccc gag aat tcc gga cgc agg ccg atg gcg ctg tat tca cgc			3120
Gly Ala Pro Glu Asn Ser Gly Arg Arg Pro Met Ala Leu Tyr Ser Arg			
1025	1030	1035	1040
ccc gaa ggg gcg gcg gag cat gac tgg acg cgg cac gcc acg ggc cgg			3168
Pro Glu Gly Ala Ala Glu His Asp Trp Thr Arg His Ala Thr Gly Arg			
1045	1050	1055	
ttg gcg cca ggc cgc ggc gag gcg gct gga gac ctg gcc gac tgg ccg			3216
Leu Ala Pro Gly Arg Gly Glu Ala Ala Gly Asp Leu Ala Asp Trp Pro			
1060	1065	1070	
gct cct ggc gcg ctg ccg gtc gac ctc gac gaa ttc tat cgg gac ctc			3264
Ala Pro Gly Ala Leu Pro Val Asp Leu Asp Glu Phe Tyr Arg Asp Leu			
1075	1080	1085	
gca gag ctt ggg ctg gag tac ggc ccg atc ttc caa ggg ctc aag gcg			3312
Ala Glu Leu Gly Leu Glu Tyr Gly Pro Ile Phe Gln Gly Leu Lys Ala			
1090	1095	1100	
gcc tgg cgg caa ggg gac gag gtg tac gcc gaa gcc gcg ctg ccg gga			3360
Ala Trp Arg Gln Gly Asp Glu Val Tyr Ala Glu Ala Ala Leu Pro Gly			
1105	1110	1115	1120
acg gaa gat tct ggt ttc ggg gtg cat ccg gca ctg ctg gac gcg gct			3408
Thr Glu Asp Ser Gly Phe Gly Val His Pro Ala Leu Leu Asp Ala Ala			
1125	1130	1135	
ctg cac gca acg gct gtc cga gac atg gat gac gca cgc ttg ccg ttc			3456
Leu His Ala Thr Ala Val Arg Asp Met Asp Asp Ala Arg Leu Pro Phe			
1140	1145	1150	
cag tgg gaa ggt gtg tcc ctg cac gcc aag gcc gcg ccg gct ttg cgg			3504
Gln Trp Glu Gly Val Ser Leu His Ala Lys Ala Ala Pro Ala Leu Arg			
1155	1160	1165	
gtc cgc gtg gtc ccg gct ggt gac gat gcc aag tcc ctg ctg gtt tgt			3552
Val Arg Val Val Pro Ala Gly Asp Asp Ala Lys Ser Leu Leu Val Cys			
1170	1175	1180	
gat ggc acc ggt cga ccg gtg atc tcg gtg gac cga ctc gta ttg cgg			3600
Asp Gly Thr Gly Arg Pro Val Ile Ser Val Asp Arg Leu Val Leu Arg			
1185	1190	1195	1200
tcg gct gcg gcc cgg cgg acc ggt gcg cgc cga cag gcc cat caa gct			3648
Ser Ala Ala Ala Arg Arg Thr Gly Ala Arg Arg Gln Ala His Gln Ala			

1205	1210	1215	
cgg ttg tac cgg ttg agc tgg cca acg gtt caa ctg ccg aca tcc gct			3696
Arg Leu Tyr Arg Leu Ser Trp Pro Thr Val Gln Leu Pro Thr Ser Ala			
1220	1225	1230	
cag cca ccg tcc tgc gtg ctt ctc ggc acc tca gaa gtg tcc gct gac			3744
Gln Pro Pro Ser Cys Val Leu Leu Gly Thr Ser Glu Val Ser Ala Asp			
1235	1240	1245	
ata cag gtg tat ccg gac ctc cgg tcg ttg acg gct gcg ttg gat gcc			3792
Ile Gln Val Tyr Pro Asp Leu Arg Ser Leu Thr Ala Ala Leu Asp Ala			
1250	1255	1260	
ggt gcc gaa cca ccc ggc gtc gtc atc gca ccc acg ccc ccc ggc ggt			3840
Gly Ala Glu Pro Pro Gly Val Val Ile Ala Pro Thr Pro Pro Gly Gly			
1265	1270	1275	1280
gga cga aca gcg gat gtc cgg gag acg act cgg cat gca ctc gac ctg			3888
Gly Arg Thr Ala Asp Val Arg Glu Thr Thr Arg His Ala Leu Asp Leu			
1285	1290	1295	
gta caa ggc tgg ctt tcc gat cag cga ctc aac gaa tcc cga ttg ctc			3936
Val Gln Gly Trp Leu Ser Asp Gln Arg Leu Asn Glu Ser Arg Leu Leu			
1300	1305	1310	
ctg gtg aca cag gga gca gtg gcc gtg gag ccg ggc gaa ccc gtg acc			3984
Leu Val Thr Gln Gly Ala Val Ala Val Glu Pro Gly Glu Pro Val Thr			
1315	1320	1325	
gat ctg gcg cag gcc gcg ctc tgg gga ctg ctg ccg tgc acg cag acc			4032
Asp Leu Ala Gln Ala Ala Leu Trp Gly Leu Leu Arg Ser Thr Gln Thr			
1330	1335	1340	
gaa cac cct gat cgc ttc gtc ctc gtc gat gtg cct gag ccc gcg caa			4080
Glu His Pro Asp Arg Phe Val Leu Val Asp Val Pro Glu Pro Ala Gln			
1345	1350	1355	1360
ctc ctc ccc gcg ctg ccg ggg gtg ctg gcc tgc ggc gaa cct cag ctc			4128
Leu Leu Pro Ala Leu Pro Gly Val Leu Ala Cys Gly Glu Pro Gln Leu			
1365	1370	1375	
gcg ttg cga cgt ggc ggc gct cat gcg ccc aga ctg gct gga ctg ggc			4176
Ala Leu Arg Arg Gly Gly Ala His Ala Pro Arg Leu Ala Gly Leu Gly			
1380	1385	1390	
agc gat gac gtc ctg ccc gtg ccg gac ggc acc ggg tgg cga ttg gag			4224
Ser Asp Asp Val Leu Pro Val Pro Asp Gly Thr Gly Trp Arg Leu Glu			

1395	1400	1405	
gcc acg cgc ccg gga agc ctg gat ggg ttg gca ttg gtg gac gaa ccg			4272
Ala Thr Arg Pro Gly Ser Leu Asp Gly Leu Ala Leu Val Asp Glu Pro			
1410	1415	1420	
acg gcc acg gca ccg ctg ggt gac ggt gag gtc agg att gcg atg cgc			4320
Thr Ala Thr Ala Pro Leu Gly Asp Gly Glu Val Arg Ile Ala Met Arg			
1425	1430	1435	1440
gcg gcc ggg gtg aac ttc cgg gat gcg ctc atc gcg ctc ggt atg tat			4368
Ala Ala Gly Val Asn Phe Arg Asp Ala Leu Ile Ala Leu Gly Met Tyr			
1445	1450	1455	
ccc ggt gtg gca tcg ctg ggc agt gag ggc gcc ggg gtc gtg gtg gag			4416
Pro Gly Val Ala Ser Leu Gly Ser Glu Gly Ala Gly Val Val Val Glu			
1460	1465	1470	
acc ggc ccc ggc gtc acc ggc ctg gca ccc ggc gac cgc gtg atg gga			4464
Thr Gly Pro Gly Val Thr Gly Leu Ala Pro Gly Asp Arg Val Met Gly			
1475	1480	1485	
atg atc ccg aag gcg ttc ggg ccg ctc gcg gtc gcc gac cat cgc atg			4512
Met Ile Pro Lys Ala Phe Gly Pro Leu Ala Val Ala Asp His Arg Met			
1490	1495	1500	
gtg acg agg att ccc gct ggt tgg agc ttc gcg ccg gcc gca tcg gtg			4560
Val Thr Arg Ile Pro Ala Gly Trp Ser Phe Ala Arg Ala Ala Ser Val			
1505	1510	1515	1520
ccg atc gtc ttt ctc acc gcc tac tac gcg ctg gtt gat ctc gcc ggg			4608
Pro Ile Val Phe Leu Thr Ala Tyr Tyr Ala Leu Val Asp Leu Ala Gly			
1525	1530	1535	
ttg aga cca ggg gag tcg ttg ctg gtt cat tcg gcc gcc ggt ggg gtg			4656
Leu Arg Pro Gly Glu Ser Leu Leu Val His Ser Ala Ala Gly Gly Val			
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ggg atg gcc gcg atc caa ctc gcc agg cac ctc ggt gca gag gtg tac			4704
Gly Met Ala Ala Ile Gln Leu Ala Arg His Leu Gly Ala Glu Val Tyr			
1555	1560	1565	
gcc acc gct agc gag gac aag tgg caa gcc gtg gag ctg agc cga gaa			4752
Ala Thr Ala Ser Glu Asp Lys Trp Gln Ala Val Glu Leu Ser Arg Glu			
1570	1575	1580	
cac ctc gct tcg tcg cgg acg tgc gat ttc gag cag cag ttc ctc ggg			4800
His Leu Ala Ser Ser Arg Thr Cys Asp Phe Glu Gln Gln Phe Leu Gly			

1585	1590	1595	1600	
gca acc ggc gga cgc ggc gtc gac gtc gtg ctc aac tcc ctc gcc ggg				4848
Ala Thr Gly Gly Arg Gly Val Asp Val Val Leu Asn Ser Leu Ala Gly				
	1605	1610	1615	
gag ttc gcc gat gcg tct ctg cga atg ctg ccg cgc ggt ggc cgt ttc				4896
Glu Phe Ala Asp Ala Ser Leu Arg Met Leu Pro Arg Gly Gly Arg Phe				
	1620	1625	1630	
ctg gag ttg ggg aag acg gat gtt cgt gac ccc gtc gag gtc gcc gat				4944
Leu Glu Leu Gly Lys Thr Asp Val Arg Asp Pro Val Glu Val Ala Asp				
	1635	1640	1645	
gcg cat ccg ggc gtg tct tac cag gct ttc gat acc gta gag gca ggc				4992
Ala His Pro Gly Val Ser Tyr Gln Ala Phe Asp Thr Val Glu Ala Gly				
	1650	1655	1660	
ccg cag cga atc ggc gag atg ctt cac gag ctg gtg gag ttg ttc gag				5040
Pro Gln Arg Ile Gly Glu Met Leu His Glu Leu Val Glu Leu Phe Glu				
	1665	1670	1675	1680
gga cgc gtg ctg gag ccc ctg cct gtc acg gct tgg gac gtt cgg cag				5088
Gly Arg Val Leu Glu Pro Leu Pro Val Thr Ala Trp Asp Val Arg Gln				
	1685	1690	1695	
gcg ccc gag gcg cta cgg cac ctg agc caa gcg cgg cat gtg gga aag				5136
Ala Pro Glu Ala Leu Arg His Leu Ser Gln Ala Arg His Val Gly Lys				
	1700	1705	1710	
ctg gtg ctc acc atg cct ccg gtg tgg gac gcc gca ggc acg gtt ctg				5184
Leu Val Leu Thr Met Pro Pro Val Trp Asp Ala Ala Gly Thr Val Leu				
	1715	1720	1725	
gtt acc ggc gga acg gga gca ctt ggc gca gag gtc gcc cgg cac ctc				5232
Val Thr Gly Gly Thr Gly Ala Leu Gly Ala Glu Val Ala Arg His Leu				
	1730	1735	1740	
gtg atc gag cgc ggg gtg cga aac ctg gtc ctc gtc agc agg cgc ggt				5280
Val Ile Glu Arg Gly Val Arg Asn Leu Val Leu Val Ser Arg Arg Gly				
	1745	1750	1755	1760
ccc gca gcc agt ggc gct gct gag ctc gtg gcg caa ctg acg gcc tac				5328
Pro Ala Ala Ser Gly Ala Ala Glu Leu Val Ala Gln Leu Thr Ala Tyr				
	1765	1770	1775	
ggg gcc gag gtt tcc ttg cag gct tgc gat gtc gcc gat cgt gag acc				5376
Gly Ala Glu Val Ser Leu Gln Ala Cys Asp Val Ala Asp Arg Glu Thr				

1780	1785	1790	
ttg gcg aag gtg ctt gcc agc atc ccg gac gag cat ccg ttg acc gcc			5424
Leu Ala Lys Val Leu Ala Ser Ile Pro Asp Glu His Pro Leu Thr Ala			
1795	1800	1805	
gtg gtg cac gcg gct ggt gtt ctc gac gac gga gtg tcc gaa tcg ctc			5472
Val Val His Ala Ala Gly Val Leu Asp Asp Gly Val Ser Glu Ser Leu			
1810	1815	1820	
acc gtg gag cgg ctg gac cag gtt ctg cgc ccg aag gtc gat ggc gcg			5520
Thr Val Glu Arg Leu Asp Gln Val Leu Arg Pro Lys Val Asp Gly Ala			
1825	1830	1835	1840
cgg aat ctg ctc gag ctg atc gac ccg gac gtg gcc ctc gtg ttg ttc			5568
Arg Asn Leu Leu Glu Leu Ile Asp Pro Asp Val Ala Leu Val Leu Phe			
1845	1850	1855	
tcg tcg gtg tcg ggt gtg ctc ggc agc ggt ggg cag ggt aac tac gcg			5616
Ser Ser Val Ser Gly Val Leu Gly Ser Gly Gly Gln Gly Asn Tyr Ala			
1860	1865	1870	
gcg gcc aac tcc ttc ctc gac gca ttg gcg cag caa agg cag tcg cgc			5664
Ala Ala Asn Ser Phe Leu Asp Ala Leu Ala Gln Gln Arg Gln Ser Arg			
1875	1880	1885	
ggc cta ccg acg aga tca ttg gcc tgg ggg ccc tgg gcg gaa cat ggc			5712
Gly Leu Pro Thr Arg Ser Leu Ala Trp Gly Pro Trp Ala Glu His Gly			
1890	1895	1900	
atg gcc agc acc ttg cgc gaa gcc gag cag gat cga ttg gcg cga tct			5760
Met Ala Ser Thr Leu Arg Glu Ala Glu Gln Asp Arg Leu Ala Arg Ser			
1905	1910	1915	1920
ggg ttg ctg ccg atc tcg acc gag gag ggg ttg tcc cag ttc gac gcc			5808
Gly Leu Leu Pro Ile Ser Thr Glu Glu Gly Leu Ser Gln Phe Asp Ala			
1925	1930	1935	
gcg tgc ggc ggc gcg cat acc gtg gtg gcg ccg gtt cga ttc agc cgc			5856
Ala Cys Gly Gly Ala His Thr Val Val Ala Pro Val Arg Phe Ser Arg			
1940	1945	1950	
ttg tcc gac ggg aac gcg atc aag ttc tcc gtc ctg caa ggt ttg gtc			5904
Leu Ser Asp Gly Asn Ala Ile Lys Phe Ser Val Leu Gln Gly Leu Val			
1955	1960	1965	
ggg ccg cat cgc gtc aac aaa gcg gcg act gcg gat gat gcc gag agc			5952
Gly Pro His Arg Val Asn Lys Ala Ala Thr Ala Asp Asp Ala Glu Ser			

1970	1975	1980	
ctc cgg aaa cgg ttg gga cgc ttg ccg gat gca gaa caa cat cgg att			6000
Leu Arg Lys Arg Leu Gly Arg Leu Pro Asp Ala Glu Gln His Arg Ile			
1985	1990	1995	2000
ctg ctg gac ctc gtc cgc atg cat gtg gcg gca gtg ctc gga ttc gcc			6048
Leu Leu Asp Leu Val Arg Met His Val Ala Ala Val Leu Gly Phe Ala			
2005	2010	2015	
ggg tct cag gag atc acc gcg gac ggc acg ttc aag gtg ctg ggc ttc			6096
Gly Ser Gln Glu Ile Thr Ala Asp Gly Thr Phe Lys Val Leu Gly Phe			
2020	2025	2030	
gac tcg ttg acc gtg gtc gag ttg cgc aac cgg atc aac ggg gcg acg			6144
Asp Ser Leu Thr Val Val Glu Leu Arg Asn Arg Ile Asn Gly Ala Thr			
2035	2040	2045	
ggg ctg cga ctg ccc gcc acc ctg gtg ttc aac tac ccg acg ccg gat			6192
Gly Leu Arg Leu Pro Ala Thr Leu Val Phe Asn Tyr Pro Thr Pro Asp			
2050	2055	2060	
gcg ctc gcc gcg cac ctc gtc acc gcg ctg tcc gca gac cgc ctg gcc			6240
Ala Leu Ala Ala His Leu Val Thr Ala Leu Ser Ala Asp Arg Leu Ala			
2065	2070	2075	2080
ggg aca ttc gag gaa ctc gac agg tgg gcg gcg aac ctg ccc acg ctg			6288
Gly Thr Phe Glu Glu Leu Asp Arg Trp Ala Ala Asn Leu Pro Thr Leu			
2085	2090	2095	
gcc agg gat gag gcc acg cgg gcg cag atc acc acc cgg cta cag gcg			6336
Ala Arg Asp Glu Ala Thr Arg Ala Gln Ile Thr Thr Arg Leu Gln Ala			
2100	2105	2110	
atc ttg cag agc ctg gcg gac gtg tcc ggc gga acc ggc ggc ggc tcc			6384
Ile Leu Gln Ser Leu Ala Asp Val Ser Gly Gly Thr Gly Gly Gly Ser			
2115	2120	2125	
gtg ccg gac cgg ctc aga tcg gcc acg gac gac gag ctt ttc caa ctc			6432
Val Pro Asp Arg Leu Arg Ser Ala Thr Asp Asp Glu Leu Phe Gln Leu			
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Leu Asp Asn Asp Leu Glu Leu Pro			
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<210> 44

<211> 2152

<212> PRT

<213> Saccharopolyspora spinosa

<400> 44

Met Thr Val Thr Thr Ser Tyr Glu Glu Val Val Glu Ala Leu Arg Ala

1 5 10 15

Ser Leu Lys Glu Asn Glu Arg Leu Arg Arg Gly Arg Asp Arg Phe Ser

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Ala Glu Lys Asp Asp Pro Ile Ala Ile Val Ala Met Ser Cys Arg Tyr

35 40 45

Pro Gly Gln Val Ser Ser Pro Glu Asp Leu Trp Gln Leu Ala Ala Gly

50 55 60

Gly Val Asp Ala Ile Ser Glu Val Pro Gly Asp Arg Gly Trp Asp Leu

65 70 75 80

Asp Gly Val Phe Val Pro Asp Ser Asp Arg Pro Gly Thr Ser Tyr Ala

85 90 95

Cys Ala Gly Gly Phe Leu Gln Gly Val Ser Glu Phe Asp Ala Gly Phe

100 105 110

Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg

115 120 125

Leu Leu Leu Glu Val Ala Trp Glu Val Phe Glu Arg Ala Gly Leu Glu

130 135 140

Gln Arg Ser Thr Arg Gly Ser Arg Val Gly Val Phe Val Gly Thr Asn

145 150 155 160

Gly Gln Asp Tyr Ala Ser Trp Leu Arg Thr Pro Pro Pro Ala Val Ala

165 170 175

Gly His Val Leu Thr Gly Gly Ala Ala Ala Val Leu Ser Gly Arg Val

180 185 190

Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala

195 200 205

Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ala Leu Arg

210 215 220

Ala Gly Glu Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met Ser

225	230	235	240
Thr Pro Lys Val Phe Leu Glu Phe Ser Arg Gln Arg Gly Leu Ala Pro	245	250	255
Asp Gly Arg Cys Lys Ser Phe Ala Ala Gly Ala Asp Gly Thr Gly Trp	260	265	270
Gly Glu Gly Ala Gly Leu Leu Leu Leu Glu Arg Leu Ser Asp Ala Arg	275	280	285
Arg Asn Gly His Glu Val Leu Ala Val Val Arg Gly Ser Ala Val Asn	290	295	300
Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Ser Ser Gln	305	310	315 320
Gln Arg Val Ile Thr Gln Ala Leu Ala Ser Ala Gly Leu Ser Val Ser	325	330	335
Asp Val Asp Ala Val Glu Ala His Gly Thr Gly Thr Arg Leu Gly Asp	340	345	350
Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr Gly Arg Asp Arg Asp	355	360	365
Pro Gly Arg Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile Gly His	370	375	380
Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile Lys Met Val Met Ala	385	390	395 400
Met Arg His Gly Gln Leu Pro Arg Thr Leu His Val Glu Ser Pro Ser	405	410	415
Pro Glu Val Asp Trp Ser Ala Gly Thr Val Gln Leu Leu Thr Glu Asn	420	425	430
Thr Pro Trp Pro Arg Ser Gly Arg Val Arg Arg Val Gly Val Ser Ser	435	440	445
Phe Gly Ile Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Pro Pro	450	455	460
Gly Val Pro Ser Gln Ser Ala Gly Pro Gly Ser Gly Ser Val Val Asp	465	470	475 480
Val Pro Val Val Pro Trp Met Val Ser Gly Lys Thr Pro Glu Ala Leu			

485	490	495
Ser Ala Gln Ala Thr Ala Leu Met Thr Tyr Leu Asp Glu Arg Pro Asp 500	505	510
Val Ser Ser Leu Asp Val Gly Tyr Ser Leu Ala Leu Thr Arg Ser Ala 515	520	525
Leu Asp Glu Arg Ala Val Val Leu Gly Ser Asp Arg Glu Thr Leu Leu 530	535	540
Cys Gly Val Lys Ala Leu Ser Ala Gly His Glu Ala Ser Gly Leu Val 545	550	555 560
Thr Gly Ser Val Gly Ala Gly Gly Arg Ile Gly Phe Val Phe Ser Gly 565	570	575
Gln Gly Gly Gln Trp Leu Gly Met Gly Arg Gly Leu Tyr Arg Ala Phe 580	585	590
Pro Val Phe Ala Ala Ala Phe Asp Glu Ala Cys Ala Glu Leu Asp Ala 595	600	605
His Leu Gly Gln Glu Ile Gly Val Arg Glu Val Val Ser Gly Ser Asp 610	615	620
Ala Gln Leu Leu Asp Arg Thr Leu Trp Ala Gln Ser Gly Leu Phe Ala 625	630	635 640
Leu Gln Val Gly Leu Leu Lys Leu Leu Asp Ser Trp Gly Val Arg Pro 645	650	655
Ser Val Val Leu Gly His Ser Val Gly Glu Leu Ala Ala Ala Phe Ala 660	665	670
Ala Gly Val Val Ser Leu Ser Gly Ala Ala Arg Leu Val Ala Gly Arg 675	680	685
Ala Arg Leu Met Gln Ala Leu Pro Ser Gly Gly Gly Met Leu Ala Val 690	695	700
Pro Ala Gly Glu Glu Leu Leu Trp Ser Leu Leu Ala Asp Gln Gly Asp 705	710	715 720
Arg Val Gly Ile Ala Ala Val Asn Ala Ala Gly Ser Val Val Leu Ser 725	730	735
Gly Asp Arg Asp Val Leu Asp Asp Leu Ala Gly Arg Leu Asp Gly Gln		

740					745					750						
Gly	Ile	Arg	Ser	Arg	Trp	Leu	Arg	Val	Ser	His	Ala	Phe	His	Ser	Tyr	
755					760					765						
Arg	Met	Asp	Pro	Met	Leu	Ala	Glu	Phe	Ala	Glu	Leu	Ala	Arg	Thr	Val	
770					775					780						
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785					790					795					800	
Leu	Asp	Asp	Ala	Gly	Arg	Met	Ser	Gly	Pro	Asp	Tyr	Trp	Val	Arg	Gln	
805					810					815						
Val	Arg	Glu	Pro	Val	Arg	Phe	Ala	Asp	Gly	Val	Gln	Ala	Leu	Val	Glu	
820					825					830						
His	Asp	Val	Ala	Thr	Val	Val	Glu	Leu	Gly	Pro	Asp	Gly	Ala	Leu	Ser	
835					840					845						
Ala	Leu	Ile	Gln	Glu	Cys	Val	Ala	Ala	Ser	Asp	His	Ala	Gly	Arg	Leu	
850					855					860						
Ser	Ala	Val	Pro	Ala	Met	Arg	Arg	Asn	Gln	Asp	Glu	Ala	Gln	Lys	Val	
865					870					875					880	
Met	Thr	Ala	Leu	Ala	His	Val	His	Val	Arg	Gly	Gly	Ala	Val	Asp	Trp	
885					890					895						
Arg	Ser	Phe	Phe	Ala	Gly	Thr	Gly	Ala	Lys	Gln	Ile	Glu	Leu	Pro	Thr	
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Tyr	Ala	Phe	Gln	Arg	Gln	Arg	Tyr	Trp	Leu	Val	Pro	Ser	Asp	Ser	Gly	
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Asp	Val	Thr	Gly	Ala	Gly	Leu	Ala	Gly	Ala	Glu	His	Pro	Leu	Leu	Gly	
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Gly	Glu	Arg	Leu	Gly	Cys	Glu	Arg	Val	Glu	Glu	Leu	Thr	Leu	Glu	Ala	

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Pro Leu Val Leu Pro Glu Arg Gly Ala Ile Gln Val Gln Leu Arg Val		
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Gly Ala Pro Glu Asn Ser Gly Arg Arg Pro Met Ala Leu Tyr Ser Arg		
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Pro Glu Gly Ala Ala Glu His Asp Trp Thr Arg His Ala Thr Gly Arg		
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Leu Ala Pro Gly Arg Gly Glu Ala Ala Gly Asp Leu Ala Asp Trp Pro		
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Ala Pro Gly Ala Leu Pro Val Asp Leu Asp Glu Phe Tyr Arg Asp Leu		
1075	1080	1085
Ala Glu Leu Gly Leu Glu Tyr Gly Pro Ile Phe Gln Gly Leu Lys Ala		
1090	1095	1100
Ala Trp Arg Gln Gly Asp Glu Val Tyr Ala Glu Ala Ala Leu Pro Gly		
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Thr Glu Asp Ser Gly Phe Gly Val His Pro Ala Leu Leu Asp Ala Ala		
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Leu His Ala Thr Ala Val Arg Asp Met Asp Asp Ala Arg Leu Pro Phe		
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Gln Trp Glu Gly Val Ser Leu His Ala Lys Ala Ala Pro Ala Leu Arg		
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Val Arg Val Val Pro Ala Gly Asp Asp Ala Lys Ser Leu Leu Val Cys		
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Asp Gly Thr Gly Arg Pro Val Ile Ser Val Asp Arg Leu Val Leu Arg		
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Arg Leu Tyr Arg Leu Ser Trp Pro Thr Val Gln Leu Pro Thr Ser Ala		
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Gln Pro Pro Ser Cys Val Leu Leu Gly Thr Ser Glu Val Ser Ala Asp		
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Ile Gln Val Tyr Pro Asp Leu Arg Ser Leu Thr Ala Ala Leu Asp Ala		

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Gly Arg Thr Ala Asp Val Arg Glu Thr Thr Arg His Ala Leu Asp Leu		
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Val Gln Gly Trp Leu Ser Asp Gln Arg Leu Asn Glu Ser Arg Leu Leu		
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Leu Val Thr Gln Gly Ala Val Ala Val Glu Pro Gly Glu Pro Val Thr		
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Asp Leu Ala Gln Ala Ala Leu Trp Gly Leu Leu Arg Ser Thr Gln Thr		
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Glu His Pro Asp Arg Phe Val Leu Val Asp Val Pro Glu Pro Ala Gln		
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Leu Leu Pro Ala Leu Pro Gly Val Leu Ala Cys Gly Glu Pro Gln Leu		
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Ala Leu Arg Arg Gly Gly Ala His Ala Pro Arg Leu Ala Gly Leu Gly		
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Ser Asp Asp Val Leu Pro Val Pro Asp Gly Thr Gly Trp Arg Leu Glu		
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Ala Thr Arg Pro Gly Ser Leu Asp Gly Leu Ala Leu Val Asp Glu Pro		
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Thr Ala Thr Ala Pro Leu Gly Asp Gly Glu Val Arg Ile Ala Met Arg		
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Ala Ala Gly Val Asn Phe Arg Asp Ala Leu Ile Ala Leu Gly Met Tyr		
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Pro Gly Val Ala Ser Leu Gly Ser Glu Gly Ala Gly Val Val Val Glu		
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Thr Gly Pro Gly Val Thr Gly Leu Ala Pro Gly Asp Arg Val Met Gly		
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Met Ile Pro Lys Ala Phe Gly Pro Leu Ala Val Ala Asp His Arg Met		
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Val Thr Arg Ile Pro Ala Gly Trp Ser Phe Ala Arg Ala Ala Ser Val		

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Leu Arg Pro Gly Glu Ser Leu Leu Val His Ser Ala Ala Gly Gly Val	1540	1545	1550
Gly Met Ala Ala Ile Gln Leu Ala Arg His Leu Gly Ala Glu Val Tyr	1555	1560	1565
Ala Thr Ala Ser Glu Asp Lys Trp Gln Ala Val Glu Leu Ser Arg Glu	1570	1575	1580
His Leu Ala Ser Ser Arg Thr Cys Asp Phe Glu Gln Gln Phe Leu Gly	585	1590	1595
Ala Thr Gly Gly Arg Gly Val Asp Val Val Leu Asn Ser Leu Ala Gly	1605	1610	1615
Glu Phe Ala Asp Ala Ser Leu Arg Met Leu Pro Arg Gly Gly Arg Phe	1620	1625	1630
Leu Glu Leu Gly Lys Thr Asp Val Arg Asp Pro Val Glu Val Ala Asp	1635	1640	1645
Ala His Pro Gly Val Ser Tyr Gln Ala Phe Asp Thr Val Glu Ala Gly	1650	1655	1660
Pro Gln Arg Ile Gly Glu Met Leu His Glu Leu Val Glu Leu Phe Glu	665	1670	1675
Gly Arg Val Leu Glu Pro Leu Pro Val Thr Ala Trp Asp Val Arg Gln	1685	1690	1695
Ala Pro Glu Ala Leu Arg His Leu Ser Gln Ala Arg His Val Gly Lys	1700	1705	1710
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Val Ile Glu Arg Gly Val Arg Asn Leu Val Leu Val Ser Arg Arg Gly	745	1750	1755
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Leu Ala Lys Val Leu Ala Ser Ile Pro Asp Glu His Pro Leu Thr Ala		
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Val Val His Ala Ala Gly Val Leu Asp Asp Gly Val Ser Glu Ser Leu		
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Thr Val Glu Arg Leu Asp Gln Val Leu Arg Pro Lys Val Asp Gly Ala		
825	1830	1835 1840
Arg Asn Leu Leu Glu Leu Ile Asp Pro Asp Val Ala Leu Val Leu Phe		
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Ser Ser Val Ser Gly Val Leu Gly Ser Gly Gly Gln Gly Asn Tyr Ala		
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Ala Ala Asn Ser Phe Leu Asp Ala Leu Ala Gln Gln Arg Gln Ser Arg		
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Gly Leu Pro Thr Arg Ser Leu Ala Trp Gly Pro Trp Ala Glu His Gly		
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Met Ala Ser Thr Leu Arg Glu Ala Glu Gln Asp Arg Leu Ala Arg Ser		
905	1910	1915 1920
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Ala Cys Gly Gly Ala His Thr Val Val Ala Pro Val Arg Phe Ser Arg		
1940	1945	1950
Leu Ser Asp Gly Asn Ala Ile Lys Phe Ser Val Leu Gln Gly Leu Val		
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Gly Pro His Arg Val Asn Lys Ala Ala Thr Ala Asp Asp Ala Glu Ser		
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Leu Arg Lys Arg Leu Gly Arg Leu Pro Asp Ala Glu Gln His Arg Ile		
985	1990	1995 2000
Leu Leu Asp Leu Val Arg Met His Val Ala Ala Val Leu Gly Phe Ala		
2005	2010	2015
Gly Ser Gln Glu Ile Thr Ala Asp Gly Thr Phe Lys Val Leu Gly Phe		

2020	2025	2030
Asp Ser Leu Thr Val Val Glu Leu Arg Asn Arg Ile Asn Gly Ala Thr		
2035	2040	2045
Gly Leu Arg Leu Pro Ala Thr Leu Val Phe Asn Tyr Pro Thr Pro Asp		
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Ala Leu Ala Ala His Leu Val Thr Ala Leu Ser Ala Asp Arg Leu Ala		
065	2070	2075 2080
Gly Thr Phe Glu Glu Leu Asp Arg Trp Ala Ala Asn Leu Pro Thr Leu		
2085	2090	2095
Ala Arg Asp Glu Ala Thr Arg Ala Gln Ile Thr Thr Arg Leu Gln Ala		
2100	2105	2110
Ile Leu Gln Ser Leu Ala Asp Val Ser Gly Gly Thr Gly Gly Gly Ser		
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<223> ORF20; Polyketidsynthase

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Asp Leu His Gln Ala Arg Glu Arg Leu His Glu Ala Glu Ser Gly Glu	
20 25 30	

cgg gaa ccc atc gcg atc gtg gcg atg ggc tgc cgg tac ccg ggt ggg	144
-----------------------------------------------------------------	-----

Arg Glu Pro Ile Ala Ile Val Ala Met Gly Cys Arg Tyr Pro Gly Gly	
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Val Gln Asp Pro Glu Gly Leu Trp Lys Leu Val Ala Ser Gly Gly Asp	
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gcc atc ggt gaa ttc ccc gct gat cgt ggt tgg cac ctc gac gag ctc	240
Ala Ile Gly Glu Phe Pro Ala Asp Arg Gly Trp His Leu Asp Glu Leu	
65 70 75 80	
tac gat ccc gac ccg gat cag ccc gga acc tgc tac acc cgg cac ggc	288
Tyr Asp Pro Asp Pro Asp Gln Pro Gly Thr Cys Tyr Thr Arg His Gly	
85 90 95	
ggc ttc ctc cac gac gcc ggc gag ttc gac gcg gga ttc ttc gac atc	336
Gly Phe Leu His Asp Ala Gly Glu Phe Asp Ala Gly Phe Phe Asp Ile	
100 105 110	
agc ccc cgt gag gcg ctc gcg atg gac ccg cag cag cgg ctg ctg ctg	384
Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg Leu Leu Leu	
115 120 125	
gaa atc tcc tgg gag acc gtc gaa tcc gct ggg atg gac ccg agg tcc	432
Glu Ile Ser Trp Glu Thr Val Glu Ser Ala Gly Met Asp Pro Arg Ser	
130 135 140	
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Leu Arg Gly Ser Arg Thr Gly Val Phe Ala Gly Leu Met Tyr Glu Gly	
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tat gac acc ggc gcc cac cgg gca gga gaa ggt gtc gaa ggc tat ctc	528
Tyr Asp Thr Gly Ala His Arg Ala Gly Glu Gly Val Glu Gly Tyr Leu	
165 170 175	
gga acc ggc aat gcg gga agc gtc gcc tct ggt cgg gtt gcg tat gcg	576
Gly Thr Gly Asn Ala Gly Ser Val Ala Ser Gly Arg Val Ala Tyr Ala	
180 185 190	
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Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser	
195 200 205	
tcg ttg gtg gcg ctg cat ttg gcg tgt cag tcg ttg cgg cag ggc gag	672
Ser Leu Val Ala Leu His Leu Ala Cys Gln Ser Leu Arg Gln Gly Glu	
210 215 220	
tgt gat ctg gcg ctg gcc ggt gga gtg acg gtg atg tcg acg ccg gag	720

Cys	Asp	Leu	Ala	Leu	Ala	Gly	Gly	Val	Thr	Val	Met	Ser	Thr	Pro	Glu	
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agg	ttc	gtg	gag	ttc	tcc	cgt	cag	cgt	ggc	ctc	gca	ccg	gat	ggg	cgg	768
Arg	Phe	Val	Glu	Phe	Ser	Arg	Gln	Arg	Gly	Leu	Ala	Pro	Asp	Gly	Arg	
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tgt	aag	tgc	ttc	gcg	gcg	gct	gcg	gat	gga	acc	ggc	tgg	ggc	gag	ggc	816
Cys	Lys	Ser	Phe	Ala	Ala	Ala	Ala	Asp	Gly	Thr	Gly	Trp	Gly	Glu	Gly	
			260					265					270			
gcc	ggc	ttg	gtg	ttg	ctg	gag	cgg	ctg	tca	gac	gcc	agg	cgg	aac	ggg	864
Ala	Gly	Leu	Val	Leu	Leu	Glu	Arg	Leu	Ser	Asp	Ala	Arg	Arg	Asn	Gly	
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cat	cgg	gta	ctg	gcg	gtt	gtt	cgt	ggc	agc	gcg	gtg	aat	cag	gac	ggc	912
His	Arg	Val	Leu	Ala	Val	Val	Arg	Gly	Ser	Ala	Val	Asn	Gln	Asp	Gly	
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Ala	Ser	Asn	Gly	Leu	Thr	Ala	Pro	Asn	Gly	Leu	Ala	Gln	Glu	Arg	Val	
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att	cag	cag	gtg	ctc	acg	agt	gcg	ggg	ctg	tgc	gcg	tcc	gat	gtg	gac	1008
Ile	Gln	Gln	Val	Leu	Thr	Ser	Ala	Gly	Leu	Ser	Ala	Ser	Asp	Val	Asp	
			325					330					335			
gct	gtg	gag	gcg	cat	gga	acg	ggc	acg	cgg	ctt	ggc	gat	ccg	atc	gag	1056
Ala	Val	Glu	Ala	His	Gly	Thr	Gly	Thr	Arg	Leu	Gly	Asp	Pro	Ile	Glu	
			340					345					350			
gcg	cag	gct	ctg	ata	gcc	gcc	tat	gga	cag	gat	cgg	gac	cgg	gac	cgg	1104
Ala	Gln	Ala	Leu	Ile	Ala	Ala	Tyr	Gly	Gln	Asp	Arg	Asp	Arg	Asp	Arg	
		355					360					365				
ccg	ctg	tgg	ttg	ggg	tgc	gtc	aag	tcc	aac	atc	ggc	cat	acg	cag	gcg	1152
Pro	Leu	Trp	Leu	Gly	Ser	Val	Lys	Ser	Asn	Ile	Gly	His	Thr	Gln	Ala	
		370				375					380					
gct	gcg	ggc	gtc	gct	ggc	gtg	atc	aag	atg	gtc	atg	gcg	atg	cgg	cac	1200
Ala	Ala	Gly	Val	Ala	Gly	Val	Ile	Lys	Met	Val	Met	Ala	Met	Arg	His	
385				390						395				400		
ggg	gag	ctg	ccg	cgc	acg	ttg	cac	gtg	gac	gag	ccg	aat	tgc	cac	gtg	1248
Gly	Glu	Leu	Pro	Arg	Thr	Leu	His	Val	Asp	Glu	Pro	Asn	Ser	His	Val	
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Asp Trp Ser Ala Gly Ala Val Arg Leu Leu Thr Glu Asn Ile Arg Trp	
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Pro Gly Thr Gly Thr Arg Arg Ala Gly Val Ser Ser Phe Gly Val Ser	
435	445
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Gly Thr Asn Ala His Val Ile Leu Glu His Asp Pro Leu Ala Val Thr	
450	460
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Glu Asn Glu Glu Ala Ala Gln Ser Pro Ala Pro Gly Ile Val Pro Trp	
465	475
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Ala Leu Ser Gly Arg Ser Ser Thr Ala Leu Arg Ala Gln Ala Glu Arg	
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ctg cgc gag ctg tgc gag cag acc gat ccc gac ccc gtc gat gtc ggt	1536
Leu Arg Glu Leu Cys Glu Gln Thr Asp Pro Asp Pro Val Asp Val Gly	
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ttc tca ctg gcc gcc acg cgc acg gct tgg gag cac cga gcg gtg gtg	1584
Phe Ser Leu Ala Ala Thr Arg Thr Ala Trp Glu His Arg Ala Val Val	
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Leu Gly Arg Asp Ser Ala Thr Leu Arg Ser Gly Leu Gly Val Val Ala	
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Ser Gly Glu Pro Ala Val Asp Val Val Glu Gly Ser Val Leu Asp Gly	
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gag gtc gtc ttc gtc ttc ccc ggt cag ggc tgg cag tgg gcc ggt atg	1728
Glu Val Val Phe Val Phe Pro Gly Gln Gly Trp Gln Trp Ala Gly Met	
565	575
gca gtc gac ctg ctg gac gct tcg ccg acg ttc gcg cgc cac atg gac	1776
Ala Val Asp Leu Leu Asp Ala Ser Pro Thr Phe Ala Arg His Met Asp	
580	590
gag tgc gcc acc gcg ctg cgg agg tac gtg gac tgg tcg ttg gtc gac	1824
Glu Cys Ala Thr Ala Leu Arg Arg Tyr Val Asp Trp Ser Leu Val Asp	
595	605
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Val	Leu	Arg	Gly	Ala	Glu	Asn	Ser	Pro	Pro	Leu	Asp	Arg	Val	Asp	Val		
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Leu	Gln	Pro	Ala	Ser	Phe	Ala	Val	Met	Val	Ser	Leu	Ala	Glu	Val	Trp		
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Arg	Ser	Tyr	Gly	Val	Arg	Pro	Ala	Ala	Val	Val	Gly	His	Ser	Gln	Gly		
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gaa	atc	gcc	gcg	gcc	tgc	gca	gcc	ggg	gtg	ctg	ccg	ctg	gag	gat	gcg	2016	
Glu	Ile	Ala	Ala	Ala	Cys	Ala	Ala	Gly	Val	Leu	Pro	Leu	Glu	Asp	Ala		
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gcc	agg	ctt	gtc	gca	ttg	cgc	agc	aga	gcg	ttg	aag	gga	ctt	tcg	ggg	2064	
Ala	Arg	Leu	Val	Ala	Leu	Arg	Ser	Arg	Ala	Leu	Lys	Gly	Leu	Ser	Gly		
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cgg	ggt	ggc	atg	gcg	tcg	ctg	gcc	tgc	cct	gcg	gat	gag	gtc	gcg	gca	2112	
Arg	Gly	Gly	Met	Ala	Ser	Leu	Ala	Cys	Pro	Ala	Asp	Glu	Val	Ala	Ala		
			690					695							700		
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Leu	Phe	Ala	Gly	Ser	Gly	Gly	Arg	Leu	Glu	Val	Ala	Ala	Ile	Asn	Gly		
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ccg	cga	tcg	gtc	gtg	gtg	tcc	ggc	gat	ctg	gaa	gcg	gtg	gac	gaa	ctg	2208	
Pro	Arg	Ser	Val	Val	Val	Ser	Gly	Asp	Leu	Glu	Ala	Val	Asp	Glu	Leu		
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Leu	Ala	Glu	Cys	Ala	Glu	Lys	Asp	Met	Arg	Ala	Arg	Arg	Ile	Pro	Val		
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Asp	Tyr	Ala	Ser	His	Ser	Ala	His	Val	Glu	Val	Val	Arg	Ser	Pro	Val		
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ctg	gcg	gcc	gcc	gcc	ggg	gtg	cga	cac	cgg	gac	ggc	cag	gtg	ccg	tgg	2352	
Leu	Ala	Ala	Ala	Ala	Gly	Val	Arg	His	Arg	Asp	Gly	Gln	Val	Pro	Trp		
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tgg	tcg	acg	gtg	atc	ggc	gac	tgg	gtg	gat	ccg	gcc	agg	ctg	gac	ggc	2400	
Trp	Ser	Thr	Val	Ile	Gly	Asp	Trp	Val	Asp	Pro	Ala	Arg	Leu	Asp	Gly		
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gag	tat	tgg	tat	cgg	aac	ctc	cgg	cag	ccg	gtc	cgg	ttc	gaa	cac	gcc	2448	

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Val Gln Gly Leu Val Glu Arg Gly Phe Gly Leu Phe Ile Glu Met Ser	
820	825
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gcg cat ccg gtg ctg acc acg gcg gtc gag gaa acc ggt gcg gag tcg	2544
Ala His Pro Val Leu Thr Thr Ala Val Glu Glu Thr Gly Ala Glu Ser	
835	840
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gag acc gcc gtg gcc gcg gta ggt acc ttg cga cgt gac tcg ggc ggc	2592
Glu Thr Ala Val Ala Ala Val Gly Thr Leu Arg Arg Asp Ser Gly Gly	
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ctc cgg agg ttg ttg cat tcg ctg gcc gag gcg tac gtg cgc ggc gcc	2640
Leu Arg Arg Leu Leu His Ser Leu Ala Glu Ala Tyr Val Arg Gly Ala	
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acc gtg gac tgg gcc gtg gcg ttc ggg ggc gcg ggc cga cgg ctg gac	2688
Thr Val Asp Trp Ala Val Ala Phe Gly Gly Ala Gly Arg Arg Leu Asp	
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Phe Trp Gln Ala Val Ala Arg Gln Asp Leu Lys Ser Val Ser Asp Ala	
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Arg Tyr Arg Val Asp Trp Val Arg Val Ala Pro Gln Pro Val Arg Arg	
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Thr Leu Arg Leu Asp Val Pro Pro Ala Ala Thr Ser Gly Glu Leu Ala	
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acc gaa ctc cgc gcc gca gcc gac ggt gac ccg gtg aag gca atc ctg	3168
Thr Glu Leu Arg Ala Ala Ala Asp Gly Asp Pro Val Lys Ala Ile Leu	
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tcg ctc acc gcg ttg gac gag cga ccc cac ccc gaa tgc aag gac gtc	3216
Ser Leu Thr Ala Leu Asp Glu Arg Pro His Pro Glu Cys Lys Asp Val	
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ccg agc ggg att gcc ttg ctg ctg aac ctg gtc aag gcg ctc ggt gaa	3264
Pro Ser Gly Ile Ala Leu Leu Leu Asn Leu Val Lys Ala Leu Gly Glu	
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gcc gac ctc aga att cct ctg tgg acc atc acg cgt ggt gcg gtc aag	3312
Ala Asp Leu Arg Ile Pro Leu Trp Thr Ile Thr Arg Gly Ala Val Lys	
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Ala Gly Pro Ala Asp Arg Leu Leu Arg Pro Met Gln Ala Gln Ala Trp	
1105 1110 1115 1120	
ggt ctg ggg cga gta gcc gca ctc gaa cac ccc gag cgc tgg ggt ggg	3408
Gly Leu Gly Arg Val Ala Ala Leu Glu His Pro Glu Arg Trp Gly Gly	
1125 1130 1135	
ctg atc gac ctg ccg gat tcg ctg gac ggc gac gtc ctc acg agg ctg	3456
Leu Ile Asp Leu Pro Asp Ser Leu Asp Gly Asp Val Leu Thr Arg Leu	
1140 1145 1150	
ggc gaa gcg ctc acc aac ggc ttg gcg gaa gac caa ctg gcg att cgc	3504
Gly Glu Ala Leu Thr Asn Gly Leu Ala Glu Asp Gln Leu Ala Ile Arg	
1155 1160 1165	
cag tcg ggc gtg ctg gcc cgg cga ctg gta ccc gcc ccg gcg aat cag	3552
Gln Ser Gly Val Leu Ala Arg Arg Leu Val Pro Ala Pro Ala Asn Gln	
1170 1175 1180	
ccc gct gga cgt aag tgg cgc ccc cga ggg agc gcg ctg atc acg ggc	3600

Pro Ala Gly Arg Lys Trp Arg Pro Arg Gly Ser Ala Leu Ile Thr Gly
 1185 1190 1195 1200
 gga ctc ggc gcg gtg ggc gca cag gtg gcg agg tgg ttg gcc gaa atc 3648
 Gly Leu Gly Ala Val Gly Ala Gln Val Ala Arg Trp Leu Ala Glu Ile
 1205 1210 1215
 gga gcc gag cga atc gtg ctc acc agt cga cgg ggc aac caa gca gca 3696
 Gly Ala Glu Arg Ile Val Leu Thr Ser Arg Arg Gly Asn Gln Ala Ala
 1220 1225 1230
 ggc gcc gcc gag ctg gaa gcc gaa ctc cgg gcc ctt gga gcg caa gtg 3744
 Gly Ala Ala Glu Leu Glu Ala Glu Leu Arg Ala Leu Gly Ala Gln Val
 1235 1240 1245
 tcc atc gtg gct tgc gac gtg acc gat cgt gcc gag atg tcc gca cta 3792
 Ser Ile Val Ala Cys Asp Val Thr Asp Arg Ala Glu Met Ser Ala Leu
 1250 1255 1260
 ctg gcc gag ttc gac gtc acc gcg gtg ttc cac gcg gcc gga gtc ggt 3840
 Leu Ala Glu Phe Asp Val Thr Ala Val Phe His Ala Ala Gly Val Gly
 1265 1270 1275 1280
 cgg ctg ctg ccg ttg gcg gag acc gac cag aac ggc ctg gcc gaa ata 3888
 Arg Leu Leu Pro Leu Ala Glu Thr Asp Gln Asn Gly Leu Ala Glu Ile
 1285 1290 1295
 tgc gcg gcg aag gtc cgc ggc gct cag gtg ctg gac gaa ctg tgc gac 3936
 Cys Ala Ala Lys Val Arg Gly Ala Gln Val Leu Asp Glu Leu Cys Asp
 1300 1305 1310
 agc acc gat ctc gat gcc ttc gtc ctg ttc tcc tcg ggt gcc ggg gta 3984
 Ser Thr Asp Leu Asp Ala Phe Val Leu Phe Ser Ser Gly Ala Gly Val
 1315 1320 1325
 tgg ggc ggg ggc ggt cag ggc gct tac ggc gcg gcg aac gca ttc ttg 4032
 Trp Gly Gly Gly Gly Gln Gly Ala Tyr Gly Ala Ala Asn Ala Phe Leu
 1330 1335 1340
 gac aca ctc gcc gaa caa cgc cga gca cgc ggt ctg ccg gca acc tcg 4080
 Asp Thr Leu Ala Glu Gln Arg Arg Ala Arg Gly Leu Pro Ala Thr Ser
 1345 1350 1355 1360
 atc tcc tgg ggc agt tgg gcc ggc ggc ggc atg gcc gac ggc gcg gcg 4128
 Ile Ser Trp Gly Ser Trp Ala Gly Gly Gly Met Ala Asp Gly Ala Ala
 1365 1370 1375
 ggc gaa cac ctg cgg cga cgc ggg ata cgt ccg atg ccg gcg gcg tcg 4176

Gly Glu His Leu Arg Arg Arg Gly Ile Arg Pro Met Pro Ala Ala Ser	
1380	1385 1390
gcc atc ctg gct ctg cag gaa gta ctt gac cag gat gag acg tgc gtg	4224
Ala Ile Leu Ala Leu Gln Glu Val Leu Asp Gln Asp Glu Thr Cys Val	
1395	1400 1405
tcg atc gct gat gtg gac tgg gac cga ttc gtt ccc acg ttc gcc gcg	4272
Ser Ile Ala Asp Val Asp Trp Asp Arg Phe Val Pro Thr Phe Ala Ala	
1410	1415 1420
act cgc gcc acc cgg ttg ttc gac gaa gtg ccg gcg gcg aga aag gcg	4320
Thr Arg Ala Thr Arg Leu Phe Asp Glu Val Pro Ala Ala Arg Lys Ala	
1425	1430 1435 1440
atg ccc gcg aat ggg ccg gca gaa cca ggc ggc tcg ccg ttc gcc cgc	4368
Met Pro Ala Asn Gly Pro Ala Glu Pro Gly Gly Ser Pro Phe Ala Arg	
1445	1450 1455
aat ctc gcg gag ctg ccg gaa gcc caa cga cgc cac gaa ctg gtg gat	4416
Asn Leu Ala Glu Leu Pro Glu Ala Gln Arg Arg His Glu Leu Val Asp	
1460	1465 1470
ctg gtg tgc gcc cag gtg gca acc gtg ctc ggg cac ggc agt cgc gag	4464
Leu Val Cys Ala Gln Val Ala Thr Val Leu Gly His Gly Ser Arg Glu	
1475	1480 1485
gaa gtc cag ccc gag cgg gcg ttc cgc gcg ctc ggg ttc gac tcc ctc	4512
Glu Val Gln Pro Glu Arg Ala Phe Arg Ala Leu Gly Phe Asp Ser Leu	
1490	1495 1500
atg gcg gtg gat ctg cgc aat cgt ttg acc acc gcc acc ggg ttg cgc	4560
Met Ala Val Asp Leu Arg Asn Arg Leu Thr Thr Ala Thr Gly Leu Arg	
1505	1510 1515 1520
ctg ccg acc aca acc gtc ttc gac tac ccg aat ccg gcc gcc ttg gcc	4608
Leu Pro Thr Thr Thr Val Phe Asp Tyr Pro Asn Pro Ala Ala Leu Ala	
1525	1530 1535
gct cac ctg ctc gag gag ctg gtg ggt gat gtc gcg tcg gct gcg gtg	4656
Ala His Leu Leu Glu Glu Leu Val Gly Asp Val Ala Ser Ala Ala Val	
1540	1545 1550
acc gct gcc agc gcg ccc gcg agt gac gaa ccg atc gcg atc gtc gcg	4704
Thr Ala Ala Ser Ala Pro Ala Ser Asp Glu Pro Ile Ala Ile Val Ala	
1555	1560 1565
atg agc tgc cgg ttt ccg ggt ggc gcg cac tcg ccg gaa gac ctg tgg	4752

Met Ser Cys Arg Phe Pro Gly Gly Ala His Ser Pro Glu Asp Leu Trp	
1570	1575 1580
cgg ctg gtc gcc gcc ggc acg gag gtg atc ggc gag ttc ccc tcc gac	4800
Arg Leu Val Ala Ala Gly Thr Glu Val Ile Gly Glu Phe Pro Ser Asp	
1585	1590 1595 1600
cgg ggc tgg gat gcg gaa ggc ctt tac gat ccg gat gct tcc agg cct	4848
Arg Gly Trp Asp Ala Glu Gly Leu Tyr Asp Pro Asp Ala Ser Arg Pro	
1605	1610 1615
gga acg acg tat gcg cgg atg gcg gga ttc ctc tac gac gcc ggt gag	4896
Gly Thr Thr Tyr Ala Arg Met Ala Gly Phe Leu Tyr Asp Ala Gly Glu	
1620	1625 1630
ttc gat gcc gac ctg ttc ggc atc agc cca cgt gag gcg ttg gcg atg	4944
Phe Asp Ala Asp Leu Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met	
1635	1640 1645
gat ccg cag cag cgg ttg gtg ctc gaa atc gcc tgg gaa gcc ctc gaa	4992
Asp Pro Gln Gln Arg Leu Val Leu Glu Ile Ala Trp Glu Ala Leu Glu	
1650	1655 1660
cgg gcc gga atc gat ccg ttg tcc ttg aag ggc agt ggg gtc ggc acg	5040
Arg Ala Gly Ile Asp Pro Leu Ser Leu Lys Gly Ser Gly Val Gly Thr	
1665	1670 1675 1680
tac atc ggc gct gga agc cgt ggg tac gcg acg gat gtg cgg cag ttt	5088
Tyr Ile Gly Ala Gly Ser Arg Gly Tyr Ala Thr Asp Val Arg Gln Phe	
1685	1690 1695
ccc gag gag gcg gag ggc tac ctg ctg acg ggt acc tcg gcc agt gtg	5136
Pro Glu Glu Ala Glu Gly Tyr Leu Leu Thr Gly Thr Ser Ala Ser Val	
1700	1705 1710
ctg tcg ggt cgg gtc gcg tat tcg ttt ggt ttc gag ggt cct gcg gtg	5184
Leu Ser Gly Arg Val Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val	
1715	1720 1725
acg gtg gat acg gct tgt tcg tcg tcg ttg gtg gcg ttg cat ctg gcg	5232
Thr Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala	
1730	1735 1740
tgc cag tcg ttg cgt tcg ggc gag tgt gat ctg gcg ttg gcc ggt ggt	5280
Cys Gln Ser Leu Arg Ser Gly Glu Cys Asp Leu Ala Leu Ala Gly Gly	
1745	1750 1755 1760
gtg acc gtg atg tcg acg ccg gag atg ttc gtg gag ttc tcc cgt cag	5328

Val Thr Val Met Ser Thr Pro Glu Met Phe Val Glu Phe Ser Arg Gln	
1765	1770 1775
cgc ggt ttg gcg ccg gat ggg cgg tgc aag tcg ttc gcg gag agc gcg	5376
Arg Gly Leu Ala Pro Asp Gly Arg Cys Lys Ser Phe Ala Glu Ser Ala	
1780	1785 1790
gac ggc acc ggc tgg ggc gaa ggc gcg ggc ctg ttg ttg ctg gag cgg	5424
Asp Gly Thr Gly Trp Gly Glu Gly Ala Gly Leu Leu Leu Leu Glu Arg	
1795	1800 1805
ttg tcg gac gcc cac cgg aat ggg cat cgg gtg ttg gcg gtg gtt cgt	5472
Leu Ser Asp Ala His Arg Asn Gly His Arg Val Leu Ala Val Val Arg	
1810	1815 1820
ggg tca gcg gtg aat cag gac ggc gcc tcg aac gga ctg gcg gcg ccg	5520
Gly Ser Ala Val Asn Gln Asp Gly Ala Ser Asn Gly Leu Ala Ala Pro	
1825	1830 1835 1840
aac ggt ccg tcg cag cag cgg gtg atc aac cag gca ctc gcg aat gcg	5568
Asn Gly Pro Ser Gln Gln Arg Val Ile Asn Gln Ala Leu Ala Asn Ala	
1845	1850 1855
gct ctt tcg gcg tcc gat gtg gat gcg gtg gag gca cat ggc acc ggg	5616
Ala Leu Ser Ala Ser Asp Val Asp Ala Val Glu Ala His Gly Thr Gly	
1860	1865 1870
acc agg ctg ggt gat ccg atc gag gcg cag gca ttg atc gca acg tat	5664
Thr Arg Leu Gly Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr	
1875	1880 1885
ggg cag gcc cgg gag cgg gat cgg ccc ttg tgg ctg ggg tcg gtc aag	5712
Gly Gln Ala Arg Glu Arg Asp Arg Pro Leu Trp Leu Gly Ser Val Lys	
1890	1895 1900
tcg aac atc ggt cat acg cag gcc gcg gcg ggt gtt gcc ggt gtg atc	5760
Ser Asn Ile Gly His Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile	
1905	1910 1915 1920
aag atg gtg atg gcc atg cgg cac ggg cag ctg ccc gcc tcg ctg cac	5808
Lys Met Val Met Ala Met Arg His Gly Gln Leu Pro Ala Ser Leu His	
1925	1930 1935
gcg gat gag ccc acg tcg gag gtc gat tgg tcg tcg ggg gcg gtc cgg	5856
Ala Asp Glu Pro Thr Ser Glu Val Asp Trp Ser Ser Gly Ala Val Arg	
1940	1945 1950
ctc ctc gcc gaa cag gta cct tgg ccg gag tct gac cgt gtt cgt cgg	5904

Leu Leu Ala Glu Gln Val Pro Trp Pro Glu Ser Asp Arg Val Arg Arg	
1955 1960 1965	
gtg ggg gtt tgc tgc ttc ggg atc agc ggc acc aac gca cat gtg atc	5952
Val Gly Val Ser Ser Phe Gly Ile Ser Gly Thr Asn Ala His Val Ile	
1970 1975 1980	
ctc gaa caa gct acg aat gcg cca gat agt aca gcg gag acg gac aaa	6000
Leu Glu Gln Ala Thr Asn Ala Pro Asp Ser Thr Ala Glu Thr Asp Lys	
1985 1990 1995 2000	
aca gaa tcc gga tct act gtc gat att ccg gtc gtt ccc tgg ttg gtg	6048
Thr Glu Ser Gly Ser Thr Val Asp Ile Pro Val Val Pro Trp Leu Val	
2005 2010 2015	
tcg gga aag acg acg gat tcc ctg cgg gga caa gcc gaa cga gtc ttg	6096
Ser Gly Lys Thr Thr Asp Ser Leu Arg Gly Gln Ala Glu Arg Val Leu	
2020 2025 2030	
tct cag gtc gag tcc cgg ccg gag cag cgt tcg ctg gat gtt gcc tac	6144
Ser Gln Val Glu Ser Arg Pro Glu Gln Arg Ser Leu Asp Val Ala Tyr	
2035 2040 2045	
tcg ctt gct tct ggc cga gcc gcg ctg gat gaa cgc gct gtc gtg ctg	6192
Ser Leu Ala Ser Gly Arg Ala Ala Leu Asp Glu Arg Ala Val Val Leu	
2050 2055 2060	
ggg ggc gac cgc ggt gag ctg gtt gct gga ctg gcg gcg ttg gcc gcc	6240
Gly Ala Asp Arg Gly Glu Leu Val Ala Gly Leu Ala Ala Leu Ala Ala	
2065 2070 2075 2080	
ggg cag gag gct tct ggg gtg atc agc gga act cgt gct tct gct cgg	6288
Gly Gln Glu Ala Ser Gly Val Ile Ser Gly Thr Arg Ala Ser Ala Arg	
2085 2090 2095	
ttc ggg ttc gtg ttc tgc ggg cag ggt ggt cag tgg ttg ggg atg ggc	6336
Phe Gly Phe Val Phe Ser Gly Gln Gly Gly Gln Trp Leu Gly Met Gly	
2100 2105 2110	
aga gcg ctc tac tgc aag ttt ccg gtg ttc gct gct gcg ttt gat gag	6384
Arg Ala Leu Tyr Ser Lys Phe Pro Val Phe Ala Ala Ala Phe Asp Glu	
2115 2120 2125	
gct tgc gcc gag ttg gag gca cat ctg ggg gaa gac cgc cgg gtt cgg	6432
Ala Cys Ala Glu Leu Glu Ala His Leu Gly Glu Asp Arg Arg Val Arg	
2130 2135 2140	
gat gtg gtc ttc ggt tcc gat gcg cag ctg ctg gat cag acg ctg tgg	6480

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Pro Gly Tyr Trp Val Arg Gln Ala Arg Glu Pro Val Arg Phe Ala Asp	
2340	2345 2350
ggt gtc cag gcc ctg gca gcg cag ggc ata ggc acg gtc gtc gag ctc	7104
Gly Val Gln Ala Leu Ala Ala Gln Gly Ile Gly Thr Val Val Glu Leu	
2355	2360 2365
ggc ccg gac gga acg ctg gcg gca ctg gtt cgg gag tgt gcg acc gag	7152
Gly Pro Asp Gly Thr Leu Ala Ala Leu Val Arg Glu Cys Ala Thr Glu	
2370	2375 2380
tcc gat cgg gtt ggg cgg att tcg tcg atc cca ctg atg cgc agg gag	7200
Ser Asp Arg Val Gly Arg Ile Ser Ser Ile Pro Leu Met Arg Arg Glu	
2385	2390 2395 2400
cgg gac gag acc cgt tcg gtg atg aca gcc ctg gcg cat ctc cac acc	7248
Arg Asp Glu Thr Arg Ser Val Met Thr Ala Leu Ala His Leu His Thr	
2405	2410 2415
cgt ggt ggt gag gtg gac tgg cag gcg ttt ttc gcc ggt acc ggc gct	7296
Arg Gly Gly Glu Val Asp Trp Gln Ala Phe Phe Ala Gly Thr Gly Ala	
2420	2425 2430
agg cag ctc gag ttg cca acg tat gcc ttc caa cga cag cac tac tgg	7344
Arg Gln Leu Glu Leu Pro Thr Tyr Ala Phe Gln Arg Gln His Tyr Trp	
2435	2440 2445
atc gag tcc agt gcg cgg cca gca cgc gac cgc gca gac atc ggc gag	7392
Ile Glu Ser Ser Ala Arg Pro Ala Arg Asp Arg Ala Asp Ile Gly Glu	
2450	2455 2460
gtg gcg gaa cag ttc tgg acc gcg gtt gac caa ggc gat ctg gca acg	7440
Val Ala Glu Gln Phe Trp Thr Ala Val Asp Gln Gly Asp Leu Ala Thr	
2465	2470 2475 2480
ttg gtc gcc gct ctg gat ctt ggg gcg gac gac gac aca tgc gca tcg	7488
Leu Val Ala Ala Leu Asp Leu Gly Ala Asp Asp Asp Thr Cys Ala Ser	
2485	2490 2495
ttg agc gat gta ttg ccg gcg ttg tcc tcc tgg cga agc gga ctc cgc	7536
Leu Ser Asp Val Leu Pro Ala Leu Ser Ser Trp Arg Ser Gly Leu Arg	
2500	2505 2510
aac cgt tcg ctc gtc gat tcc tgc cgg tac cga atc agt tgg cat tcc	7584
Asn Arg Ser Leu Val Asp Ser Cys Arg Tyr Arg Ile Ser Trp His Ser	
2515	2520 2525
tct cgg gag gtg ccg gcc ccg aag att tcc ggt acc tgg ctg ttg gtc	7632

Ser Arg Glu Val Pro Ala Pro Lys Ile Ser Gly Thr Trp Leu Leu Val	
2530	2535 2540
gtg ccc ggt gct gcg gat gac gga ttg gtc acg gct ttg acg agt tca	7680
Val Pro Gly Ala Ala Asp Asp Gly Leu Val Thr Ala Leu Thr Ser Ser	
2545	2550 2555 2560
ctg gtc gga ggc ggc gcc gag gtc gtc cgg atc ggc ctg tcc gaa gag	7728
Leu Val Gly Gly Gly Ala Glu Val Val Arg Ile Gly Leu Ser Glu Glu	
	2565 2570 2575
gac ccg cac cgc gag gac gtc gca cag cgg ctg gcc aat gcg ctg acg	7776
Asp Pro His Arg Glu Asp Val Ala Gln Arg Leu Ala Asn Ala Leu Thr	
	2580 2585 2590
gat gcc ggt caa ctc ggt ggc gtg ctt tcg ctg ttg ggg ctc gat gaa	7824
Asp Ala Gly Gln Leu Gly Gly Val Leu Ser Leu Leu Gly Leu Asp Glu	
	2595 2600 2605
tcg cct gct ccg gga ttc tcc tgc ttg cca act ggt ttc gcg ctg act	7872
Ser Pro Ala Pro Gly Phe Ser Cys Leu Pro Thr Gly Phe Ala Leu Thr	
	2610 2615 2620
gtg cag ctt ctg cgg gcc ttg cgg aag gcc gac gtc gag gcg cct ttt	7920
Val Gln Leu Leu Arg Ala Leu Arg Lys Ala Asp Val Glu Ala Pro Phe	
	2625 2630 2635 2640
tgg gcg gtg acg cgc ggc ggc gtc gcg ttg gaa gat gta cgc gtg tct	7968
Trp Ala Val Thr Arg Gly Gly Val Ala Leu Glu Asp Val Arg Val Ser	
	2645 2650 2655
ccg gag cag gcc ctg gtc tgg ggg ctg ctg cgt gtc gcg gga ctg gag	8016
Pro Glu Gln Ala Leu Val Trp Gly Leu Leu Arg Val Ala Gly Leu Glu	
	2660 2665 2670
cac ccg gag ttc tgg ggt ggc ttg atc gac ctg cca tcg gac tgg gac	8064
His Pro Glu Phe Trp Gly Gly Leu Ile Asp Leu Pro Ser Asp Trp Asp	
	2675 2680 2685
gac cga ttg ggt gcc cgg ttg gcg ggt gtg ttg gcg gat ggt ggc gag	8112
Asp Arg Leu Gly Ala Arg Leu Ala Gly Val Leu Ala Asp Gly Gly Glu	
	2690 2695 2700
gat caa gtc gcc att cgc cgt ggt ggt gtg ttc gtg cgg cgg ttg gaa	8160
Asp Gln Val Ala Ile Arg Arg Gly Gly Val Phe Val Arg Arg Leu Glu	
	2705 2710 2715 2720
cgc gct ggt gcg tcg ggt gcc ggg tcg gtg tgg cgt cct cgg ggg acg	8208

Arg Ala Gly Ala Ser Gly Ala Gly Ser Val Trp Arg Pro Arg Gly Thr	2725	2730	2735
gtg ttg gtg acg ggt ggt acg ggc ggt ttg ggg gcg cat gtt gcc cgg	8256		
Val Leu Val Thr Gly Gly Thr Gly Gly Leu Gly Ala His Val Ala Arg	2740	2745	2750
tgg ttg gcc ggt gcc ggg gct gag cac gtg gtg ttg acc agc cgt cga	8304		
Trp Leu Ala Gly Ala Gly Ala Glu His Val Val Leu Thr Ser Arg Arg	2755	2760	2765
gga gcg gac gct ccg ggc gct ggg gaa ttg cgg gcg gag ctg gag gcg	8352		
Gly Ala Asp Ala Pro Gly Ala Gly Glu Leu Arg Ala Glu Leu Glu Ala	2770	2775	2780
ctg ggt gct cgg gtg tcg att gtg ccc tgc gac gtg gct gat cgt gac	8400		
Leu Gly Ala Arg Val Ser Ile Val Pro Cys Asp Val Ala Asp Arg Asp	2785	2790	2795 2800
gca gtg gct gga gtg ttg gca ggg atc ggt ggg gag tgt ccg ctg act	8448		
Ala Val Ala Gly Val Leu Ala Gly Ile Gly Gly Glu Cys Pro Leu Thr	2805	2810	2815
gcg gtg gta cac gcc gcc ggg gtc ggc gag gcg ggc gac gta gtg gag	8496		
Ala Val Val His Ala Ala Gly Val Gly Glu Ala Gly Asp Val Val Glu	2820	2825	2830
atg ggt ttg gcg gat ttt gca gcg gtg ttg tcg gcg aag gtg cgt ggt	8544		
Met Gly Leu Ala Asp Phe Ala Ala Val Leu Ser Ala Lys Val Arg Gly	2835	2840	2845
gcg gcg aat ctg gac gag ttg ctg gcc gac tcg gag ctg gat gcg ttt	8592		
Ala Ala Asn Leu Asp Glu Leu Leu Ala Asp Ser Glu Leu Asp Ala Phe	2850	2855	2860
gtg atg ttc tcc tcg gtg tcg ggg gtg tgg gga gcc ggc gga cag ggt	8640		
Val Met Phe Ser Ser Val Ser Gly Val Trp Gly Ala Gly Gly Gln Gly	2865	2870	2875 2880
gcg tat gcg gct gcg aac gcc tac ttg gat gcg ttg gcc gag cag cgt	8688		
Ala Tyr Ala Ala Ala Asn Ala Tyr Leu Asp Ala Leu Ala Glu Gln Arg	2885	2890	2895
cgg gcg agg gga ttg gtc ggg acc gcg gtt gcg tgg gga ccg tgg gcc	8736		
Arg Ala Arg Gly Leu Val Gly Thr Ala Val Ala Trp Gly Pro Trp Ala	2900	2905	2910
ggt gac ggc atg gcc gcc ggc gaa acc ggc gca cag ctg cac cgg atg	8784		

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Gly Leu Ala Ser Met Glu Pro Ser Ala Ala Leu Leu Ala Leu Gln Gly	
2930	2935 2940
gca ttg gac cgc gat gag acc tcc ctc gtc gtg gcc gat gtc gat tgg	8880
Ala Leu Asp Arg Asp Glu Thr Ser Leu Val Val Ala Asp Val Asp Trp	
2945	2950 2955 2960
gca cgg ttc gcc cca gcc ttc acc tcg gca cgt cga cgc ccg ctg ctg	8928
Ala Arg Phe Ala Pro Ala Phe Thr Ser Ala Arg Arg Arg Pro Leu Leu	
2965	2970 2975
gac acc atc gac gag gcc cga gcc gca ttg gaa acc acc ggc gaa caa	8976
Asp Thr Ile Asp Glu Ala Arg Ala Ala Leu Glu Thr Thr Gly Glu Gln	
2980	2985 2990
gcg ggc aca ggc aaa ccc gtt gag ctg acg caa cgc ctg gcc gga ctg	9024
Ala Gly Thr Gly Lys Pro Val Glu Leu Thr Gln Arg Leu Ala Gly Leu	
2995	3000 3005
tcg cgg aag gaa cgc gac gat gcg gta ttg gat ctg gtg cgg gcg gag	9072
Ser Arg Lys Glu Arg Asp Asp Ala Val Leu Asp Leu Val Arg Ala Glu	
3010	3015 3020
acg gcg gct gtg ctg gga cgc gac gat gcc acg gcc ctg gcg cca tcg	9120
Thr Ala Ala Val Leu Gly Arg Asp Asp Ala Thr Ala Leu Ala Pro Ser	
3025	3030 3035 3040
cgg ccg ttc cag gaa ctc gga ttc gac tcc ttg atg gcg gtg gag ctg	9168
Arg Pro Phe Gln Glu Leu Gly Phe Asp Ser Leu Met Ala Val Glu Leu	
3045	3050 3055
cgc aac cgg ctg aac acc gcc acc ggg atc cag ctg ccc gcc agc acg	9216
Arg Asn Arg Leu Asn Thr Ala Thr Gly Ile Gln Leu Pro Ala Ser Thr	
3060	3065 3070
att ttc gac tac ccc aat gcc gag tcg ctg tcg cgt cac ctc tgc gcc	9264
Ile Phe Asp Tyr Pro Asn Ala Glu Ser Leu Ser Arg His Leu Cys Ala	
3075	3080 3085
gag ctt ttc cca acg gag act acc gtg gac tcg gcc ctt gcc gag ctc	9312
Glu Leu Phe Pro Thr Glu Thr Thr Val Asp Ser Ala Leu Ala Glu Leu	
3090	3095 3100
gat cga atc gag cag cag ctc tcg atg ctc acc ggc gaa gcg cgg gca	9360

Asp Arg Ile Glu Gln Gln Leu Ser Met Leu Thr Gly Glu Ala Arg Ala
 3105 3110 3115 3120
 cgg gac cga atc gcg aca cga ctg cga gcc ctc cac gag aag tgg aac 9408
 Arg Asp Arg Ile Ala Thr Arg Leu Arg Ala Leu His Glu Lys Trp Asn
 3125 3130 3135
 agc gca gct gaa gta ccg acc gga gcc gat gtc ctg agc acg ctc gat 9456
 Ser Ala Ala Glu Val Pro Thr Gly Ala Asp Val Leu Ser Thr Leu Asp
 3140 3145 3150
 tcg gcg acg cac gac gag ata ttc gag ttc atc gac aac gag ctc gac 9504
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 3155 3160 3165
 ctg tcc tga 9513
 Leu Ser
 3170
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 <400> 46
 Met Ser Asn Glu Glu Lys Leu Arg Glu Tyr Leu Arg Arg Ala Leu Val
 1 5 10 15
 Asp Leu His Gln Ala Arg Glu Arg Leu His Glu Ala Glu Ser Gly Glu
 20 25 30
 Arg Glu Pro Ile Ala Ile Val Ala Met Gly Cys Arg Tyr Pro Gly Gly
 35 40 45
 Val Gln Asp Pro Glu Gly Leu Trp Lys Leu Val Ala Ser Gly Gly Asp
 50 55 60
 Ala Ile Gly Glu Phe Pro Ala Asp Arg Gly Trp His Leu Asp Glu Leu
 65 70 75 80
 Tyr Asp Pro Asp Pro Asp Gln Pro Gly Thr Cys Tyr Thr Arg His Gly
 85 90 95
 Gly Phe Leu His Asp Ala Gly Glu Phe Asp Ala Gly Phe Phe Asp Ile
 100 105 110
 Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg Leu Leu Leu

115	120	125
Glu Ile Ser Trp Glu Thr Val Glu Ser Ala Gly Met Asp Pro Arg Ser		
130	135	140
Leu Arg Gly Ser Arg Thr Gly Val Phe Ala Gly Leu Met Tyr Glu Gly		
145	150	155
Tyr Asp Thr Gly Ala His Arg Ala Gly Glu Gly Val Glu Gly Tyr Leu		
165	170	175
Gly Thr Gly Asn Ala Gly Ser Val Ala Ser Gly Arg Val Ala Tyr Ala		
180	185	190
Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser		
195	200	205
Ser Leu Val Ala Leu His Leu Ala Cys Gln Ser Leu Arg Gln Gly Glu		
210	215	220
Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met Ser Thr Pro Glu		
225	230	235
Arg Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala Pro Asp Gly Arg		
245	250	255
Cys Lys Ser Phe Ala Ala Ala Ala Asp Gly Thr Gly Trp Gly Glu Gly		
260	265	270
Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly		
275	280	285
His Arg Val Leu Ala Val Val Arg Gly Ser Ala Val Asn Gln Asp Gly		
290	295	300
Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Leu Ala Gln Glu Arg Val		
305	310	315
Ile Gln Gln Val Leu Thr Ser Ala Gly Leu Ser Ala Ser Asp Val Asp		
325	330	335
Ala Val Glu Ala His Gly Thr Gly Thr Arg Leu Gly Asp Pro Ile Glu		
340	345	350
Ala Gln Ala Leu Ile Ala Ala Tyr Gly Gln Asp Arg Asp Arg Asp Arg		
355	360	365
Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile Gly His Thr Gln Ala		

370

375

380

Ala Ala Gly Val Ala Gly Val Ile Lys Met Val Met Ala Met Arg His
 385 390 395 400

Gly Glu Leu Pro Arg Thr Leu His Val Asp Glu Pro Asn Ser His Val
 405 410 415

Asp Trp Ser Ala Gly Ala Val Arg Leu Leu Thr Glu Asn Ile Arg Trp
 420 425 430

Pro Gly Thr Gly Thr Arg Arg Ala Gly Val Ser Ser Phe Gly Val Ser
 435 440 445

Gly Thr Asn Ala His Val Ile Leu Glu His Asp Pro Leu Ala Val Thr
 450 455 460

Glu Asn Glu Glu Ala Ala Gln Ser Pro Ala Pro Gly Ile Val Pro Trp
 465 470 475 480

Ala Leu Ser Gly Arg Ser Ser Thr Ala Leu Arg Ala Gln Ala Glu Arg
 485 490 495

Leu Arg Glu Leu Cys Glu Gln Thr Asp Pro Asp Pro Val Asp Val Gly
 500 505 510

Phe Ser Leu Ala Ala Thr Arg Thr Ala Trp Glu His Arg Ala Val Val
 515 520 525

Leu Gly Arg Asp Ser Ala Thr Leu Arg Ser Gly Leu Gly Val Val Ala
 530 535 540

Ser Gly Glu Pro Ala Val Asp Val Val Glu Gly Ser Val Leu Asp Gly
 545 550 555 560

Glu Val Val Phe Val Phe Pro Gly Gln Gly Trp Gln Trp Ala Gly Met
 565 570 575

Ala Val Asp Leu Leu Asp Ala Ser Pro Thr Phe Ala Arg His Met Asp
 580 585 590

Glu Cys Ala Thr Ala Leu Arg Arg Tyr Val Asp Trp Ser Leu Val Asp
 595 600 605

Val Leu Arg Gly Ala Glu Asn Ser Pro Pro Leu Asp Arg Val Asp Val
 610 615 620

Leu Gln Pro Ala Ser Phe Ala Val Met Val Ser Leu Ala Glu Val Trp

625	630	635	640
Arg Ser Tyr Gly Val Arg Pro Ala Ala Val Val Gly His Ser Gln Gly	645	650	655
Glu Ile Ala Ala Ala Cys Ala Ala Gly Val Leu Pro Leu Glu Asp Ala	660	665	670
Ala Arg Leu Val Ala Leu Arg Ser Arg Ala Leu Lys Gly Leu Ser Gly	675	680	685
Arg Gly Gly Met Ala Ser Leu Ala Cys Pro Ala Asp Glu Val Ala Ala	690	695	700
Leu Phe Ala Gly Ser Gly Gly Arg Leu Glu Val Ala Ala Ile Asn Gly	705	710	715
Pro Arg Ser Val Val Val Ser Gly Asp Leu Glu Ala Val Asp Glu Leu	725	730	735
Leu Ala Glu Cys Ala Glu Lys Asp Met Arg Ala Arg Arg Ile Pro Val	740	745	750
Asp Tyr Ala Ser His Ser Ala His Val Glu Val Val Arg Ser Pro Val	755	760	765
Leu Ala Ala Ala Ala Gly Val Arg His Arg Asp Gly Gln Val Pro Trp	770	775	780
Trp Ser Thr Val Ile Gly Asp Trp Val Asp Pro Ala Arg Leu Asp Gly	785	790	795
Glu Tyr Trp Tyr Arg Asn Leu Arg Gln Pro Val Arg Phe Glu His Ala	805	810	815
Val Gln Gly Leu Val Glu Arg Gly Phe Gly Leu Phe Ile Glu Met Ser	820	825	830
Ala His Pro Val Leu Thr Thr Ala Val Glu Glu Thr Gly Ala Glu Ser	835	840	845
Glu Thr Ala Val Ala Ala Val Gly Thr Leu Arg Arg Asp Ser Gly Gly	850	855	860
Leu Arg Arg Leu Leu His Ser Leu Ala Glu Ala Tyr Val Arg Gly Ala	865	870	875
Thr Val Asp Trp Ala Val Ala Phe Gly Gly Ala Gly Arg Arg Leu Asp			880

885	890	895
Leu Pro Thr Tyr Pro Phe Gln Arg	Gln Arg Tyr Trp Leu Asp Lys Gly	
900	905	910
Ala Ala Ser Asp Glu Ala Arg Ala Val Ser Asp Pro Ala Ala Gly Trp		
915	920	925
Phe Trp Gln Ala Val Ala Arg Gln Asp Leu Lys Ser Val Ser Asp Ala		
930	935	940
Leu Asp Leu Asp Ala Asp Ala Pro Leu Ser Ala Thr Leu Pro Ala Leu		
945	950	955 960
Ser Val Trp His Arg Gln Glu Arg Glu Arg Val Leu Ala Asp Gly Trp		
965	970	975
Arg Tyr Arg Val Asp Trp Val Arg Val Ala Pro Gln Pro Val Arg Arg		
980	985	990
Thr Arg Glu Thr Trp Leu Leu Val Val Pro Pro Gly Gly Ile Glu Glu		
995	1000	1005
Ala Leu Val Glu Arg Leu Thr Asp Ala Leu Asn Thr Arg Gly Ile Ser		
1010	1015	1020
Thr Leu Arg Leu Asp Val Pro Pro Ala Ala Thr Ser Gly Glu Leu Ala		
1025	1030	1035 1040
Thr Glu Leu Arg Ala Ala Ala Asp Gly Asp Pro Val Lys Ala Ile Leu		
1045	1050	1055
Ser Leu Thr Ala Leu Asp Glu Arg Pro His Pro Glu Cys Lys Asp Val		
1060	1065	1070
Pro Ser Gly Ile Ala Leu Leu Leu Asn Leu Val Lys Ala Leu Gly Glu		
1075	1080	1085
Ala Asp Leu Arg Ile Pro Leu Trp Thr Ile Thr Arg Gly Ala Val Lys		
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Ala Gly Pro Ala Asp Arg Leu Leu Arg Pro Met Gln Ala Gln Ala Trp		
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Gly Leu Gly Arg Val Ala Ala Leu Glu His Pro Glu Arg Trp Gly Gly		
1125	1130	1135
Leu Ile Asp Leu Pro Asp Ser Leu Asp Gly Asp Val Leu Thr Arg Leu		

1140	1145	1150
Gly Glu Ala Leu Thr Asn Gly Leu Ala Glu Asp Gln Leu Ala Ile Arg		
1155	1160	1165
Gln Ser Gly Val Leu Ala Arg Arg Leu Val Pro Ala Pro Ala Asn Gln		
1170	1175	1180
Pro Ala Gly Arg Lys Trp Arg Pro Arg Gly Ser Ala Leu Ile Thr Gly		
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Gly Leu Gly Ala Val Gly Ala Gln Val Ala Arg Trp Leu Ala Glu Ile		
1205	1210	1215
Gly Ala Glu Arg Ile Val Leu Thr Ser Arg Arg Gly Asn Gln Ala Ala		
1220	1225	1230
Gly Ala Ala Glu Leu Glu Ala Glu Leu Arg Ala Leu Gly Ala Gln Val		
1235	1240	1245
Ser Ile Val Ala Cys Asp Val Thr Asp Arg Ala Glu Met Ser Ala Leu		
1250	1255	1260
Leu Ala Glu Phe Asp Val Thr Ala Val Phe His Ala Ala Gly Val Gly		
1265	1270	1275 1280
Arg Leu Leu Pro Leu Ala Glu Thr Asp Gln Asn Gly Leu Ala Glu Ile		
1285	1290	1295
Cys Ala Ala Lys Val Arg Gly Ala Gln Val Leu Asp Glu Leu Cys Asp		
1300	1305	1310
Ser Thr Asp Leu Asp Ala Phe Val Leu Phe Ser Ser Gly Ala Gly Val		
1315	1320	1325
Trp Gly Gly Gly Gly Gln Gly Ala Tyr Gly Ala Ala Asn Ala Phe Leu		
1330	1335	1340
Asp Thr Leu Ala Glu Gln Arg Arg Ala Arg Gly Leu Pro Ala Thr Ser		
1345	1350	1355 1360
Ile Ser Trp Gly Ser Trp Ala Gly Gly Gly Met Ala Asp Gly Ala Ala		
1365	1370	1375
Gly Glu His Leu Arg Arg Arg Gly Ile Arg Pro Met Pro Ala Ala Ser		
1380	1385	1390
Ala Ile Leu Ala Leu Gln Glu Val Leu Asp Gln Asp Glu Thr Cys Val		

1395	1400	1405
Ser Ile Ala Asp Val Asp Trp Asp Arg Phe Val Pro Thr Phe Ala Ala		
1410	1415	1420
Thr Arg Ala Thr Arg Leu Phe Asp Glu Val Pro Ala Ala Arg Lys Ala		
425	1430	1435 1440
Met Pro Ala Asn Gly Pro Ala Glu Pro Gly Gly Ser Pro Phe Ala Arg		
1445	1450	1455
Asn Leu Ala Glu Leu Pro Glu Ala Gln Arg Arg His Glu Leu Val Asp		
1460	1465	1470
Leu Val Cys Ala Gln Val Ala Thr Val Leu Gly His Gly Ser Arg Glu		
1475	1480	1485
Glu Val Gln Pro Glu Arg Ala Phe Arg Ala Leu Gly Phe Asp Ser Leu		
1490	1495	1500
Met Ala Val Asp Leu Arg Asn Arg Leu Thr Thr Ala Thr Gly Leu Arg		
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Leu Pro Thr Thr Thr Val Phe Asp Tyr Pro Asn Pro Ala Ala Leu Ala		
1525	1530	1535
Ala His Leu Leu Glu Glu Leu Val Gly Asp Val Ala Ser Ala Ala Val		
1540	1545	1550
Thr Ala Ala Ser Ala Pro Ala Ser Asp Glu Pro Ile Ala Ile Val Ala		
1555	1560	1565
Met Ser Cys Arg Phe Pro Gly Gly Ala His Ser Pro Glu Asp Leu Trp		
1570	1575	1580
Arg Leu Val Ala Ala Gly Thr Glu Val Ile Gly Glu Phe Pro Ser Asp		
585	1590	1595 1600
Arg Gly Trp Asp Ala Glu Gly Leu Tyr Asp Pro Asp Ala Ser Arg Pro		
1605	1610	1615
Gly Thr Thr Tyr Ala Arg Met Ala Gly Phe Leu Tyr Asp Ala Gly Glu		
1620	1625	1630
Phe Asp Ala Asp Leu Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met		
1635	1640	1645
Asp Pro Gln Gln Arg Leu Val Leu Glu Ile Ala Trp Glu Ala Leu Glu		

1650	1655	1660
Arg Ala Gly Ile Asp Pro Leu Ser Leu Lys Gly Ser Gly Val Gly Thr 665	1670	1675 1680
Tyr Ile Gly Ala Gly Ser Arg Gly Tyr Ala Thr Asp Val Arg Gln Phe 1685	1690	1695
Pro Glu Glu Ala Glu Gly Tyr Leu Leu Thr Gly Thr Ser Ala Ser Val 1700	1705	1710
Leu Ser Gly Arg Val Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val 1715	1720	1725
Thr Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala 1730	1735	1740
Cys Gln Ser Leu Arg Ser Gly Glu Cys Asp Leu Ala Leu Ala Gly Gly 745	1750	1755 1760
Val Thr Val Met Ser Thr Pro Glu Met Phe Val Glu Phe Ser Arg Gln 1765	1770	1775
Arg Gly Leu Ala Pro Asp Gly Arg Cys Lys Ser Phe Ala Glu Ser Ala 1780	1785	1790
Asp Gly Thr Gly Trp Gly Glu Gly Ala Gly Leu Leu Leu Leu Glu Arg 1795	1800	1805
Leu Ser Asp Ala His Arg Asn Gly His Arg Val Leu Ala Val Val Arg 1810	1815	1820
Gly Ser Ala Val Asn Gln Asp Gly Ala Ser Asn Gly Leu Ala Ala Pro 825	1830	1835 1840
Asn Gly Pro Ser Gln Gln Arg Val Ile Asn Gln Ala Leu Ala Asn Ala 1845	1850	1855
Ala Leu Ser Ala Ser Asp Val Asp Ala Val Glu Ala His Gly Thr Gly 1860	1865	1870
Thr Arg Leu Gly Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr 1875	1880	1885
Gly Gln Ala Arg Glu Arg Asp Arg Pro Leu Trp Leu Gly Ser Val Lys 1890	1895	1900
Ser Asn Ile Gly His Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile		

905	1910	1915	1920
Lys Met Val Met Ala Met Arg His Gly Gln Leu Pro Ala Ser Leu His			
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Ala Asp Glu Pro Thr Ser Glu Val Asp Trp Ser Ser Gly Ala Val Arg			
1940	1945	1950	
Leu Leu Ala Glu Gln Val Pro Trp Pro Glu Ser Asp Arg Val Arg Arg			
1955	1960	1965	
Val Gly Val Ser Ser Phe Gly Ile Ser Gly Thr Asn Ala His Val Ile			
1970	1975	1980	
Leu Glu Gln Ala Thr Asn Ala Pro Asp Ser Thr Ala Glu Thr Asp Lys			
985	1990	1995	2000
Thr Glu Ser Gly Ser Thr Val Asp Ile Pro Val Val Pro Trp Leu Val			
2005	2010	2015	
Ser Gly Lys Thr Thr Asp Ser Leu Arg Gly Gln Ala Glu Arg Val Leu			
2020	2025	2030	
Ser Gln Val Glu Ser Arg Pro Glu Gln Arg Ser Leu Asp Val Ala Tyr			
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Ser Leu Ala Ser Gly Arg Ala Ala Leu Asp Glu Arg Ala Val Val Leu			
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Gly Ala Asp Arg Gly Glu Leu Val Ala Gly Leu Ala Ala Leu Ala Ala			
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Gly Gln Glu Ala Ser Gly Val Ile Ser Gly Thr Arg Ala Ser Ala Arg			
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Phe Gly Phe Val Phe Ser Gly Gln Gly Gly Gln Trp Leu Gly Met Gly			
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Arg Ala Leu Tyr Ser Lys Phe Pro Val Phe Ala Ala Ala Phe Asp Glu			
2115	2120	2125	
Ala Cys Ala Glu Leu Glu Ala His Leu Gly Glu Asp Arg Arg Val Arg			
2130	2135	2140	
Asp Val Val Phe Gly Ser Asp Ala Gln Leu Leu Asp Gln Thr Leu Trp			
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Ala Gln Ser Gly Leu Phe Ala Leu Gln Ala Gly Leu Leu Gly Leu Leu			

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Gly Ser Trp Gly Val Arg Pro Asp Val Val Met Gly His Ser Val Gly		
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Leu Leu Ala Gly Arg Glu Glu Ser Val Ser Val Ala Ala Leu Asn Ala		
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Pro Gly Ser Val Val Leu Ser Gly Asp Arg Glu Val Leu Ala Ser Ile		
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Val Gly Arg Leu Thr Glu Leu Arg Val Arg Thr Arg Arg Leu Arg Val		
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Ser His Ala Phe His Ser His Arg Met Asp Pro Met Leu Gly Glu Phe		
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Val Ser Thr Leu Thr Gly Glu Leu Asp Arg Ala Ala Glu Met Ser Thr		
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Pro Gly Tyr Trp Val Arg Gln Ala Arg Glu Pro Val Arg Phe Ala Asp		
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Gly Val Gln Ala Leu Ala Ala Gln Gly Ile Gly Thr Val Val Glu Leu		
2355	2360	2365
Gly Pro Asp Gly Thr Leu Ala Ala Leu Val Arg Glu Cys Ala Thr Glu		
2370	2375	2380
Ser Asp Arg Val Gly Arg Ile Ser Ser Ile Pro Leu Met Arg Arg Glu		
385	2390	2395 2400
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Arg Gly Gly Glu Val Asp Trp Gln Ala Phe Phe Ala Gly Thr Gly Ala		

2420	2425	2430
Arg Gln Leu Glu Leu Pro Thr Tyr Ala Phe Gln Arg Gln His Tyr Trp		
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Ile Glu Ser Ser Ala Arg Pro Ala Arg Asp Arg Ala Asp Ile Gly Glu		
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Val Ala Glu Gln Phe Trp Thr Ala Val Asp Gln Gly Asp Leu Ala Thr		
465	2470	2475 2480
Leu Val Ala Ala Leu Asp Leu Gly Ala Asp Asp Asp Thr Cys Ala Ser		
2485	2490	2495
Leu Ser Asp Val Leu Pro Ala Leu Ser Ser Trp Arg Ser Gly Leu Arg		
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Asn Arg Ser Leu Val Asp Ser Cys Arg Tyr Arg Ile Ser Trp His Ser		
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Ser Arg Glu Val Pro Ala Pro Lys Ile Ser Gly Thr Trp Leu Leu Val		
2530	2535	2540
Val Pro Gly Ala Ala Asp Asp Gly Leu Val Thr Ala Leu Thr Ser Ser		
545	2550	2555 2560
Leu Val Gly Gly Gly Ala Glu Val Val Arg Ile Gly Leu Ser Glu Glu		
2565	2570	2575
Asp Pro His Arg Glu Asp Val Ala Gln Arg Leu Ala Asn Ala Leu Thr		
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Asp Ala Gly Gln Leu Gly Gly Val Leu Ser Leu Leu Gly Leu Asp Glu		
2595	2600	2605
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2610	2615	2620
Val Gln Leu Leu Arg Ala Leu Arg Lys Ala Asp Val Glu Ala Pro Phe		
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Trp Ala Val Thr Arg Gly Gly Val Ala Leu Glu Asp Val Arg Val Ser		
2645	2650	2655
Pro Glu Gln Ala Leu Val Trp Gly Leu Leu Arg Val Ala Gly Leu Glu		
2660	2665	2670
His Pro Glu Phe Trp Gly Gly Leu Ile Asp Leu Pro Ser Asp Trp Asp		

2675	2680	2685
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Val Leu Val Thr Gly Gly Thr Gly Gly Leu Gly Ala His Val Ala Arg		
2740	2745	2750
Trp Leu Ala Gly Ala Gly Ala Glu His Val Val Leu Thr Ser Arg Arg		
2755	2760	2765
Gly Ala Asp Ala Pro Gly Ala Gly Glu Leu Arg Ala Glu Leu Glu Ala		
2770	2775	2780
Leu Gly Ala Arg Val Ser Ile Val Pro Cys Asp Val Ala Asp Arg Asp		
785	2790	2795 2800
Ala Val Ala Gly Val Leu Ala Gly Ile Gly Gly Glu Cys Pro Leu Thr		
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Met Gly Leu Ala Asp Phe Ala Ala Val Leu Ser Ala Lys Val Arg Gly		
2835	2840	2845
Ala Ala Asn Leu Asp Glu Leu Leu Ala Asp Ser Glu Leu Asp Ala Phe		
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Val Met Phe Ser Ser Val Ser Gly Val Trp Gly Ala Gly Gly Gln Gly		
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Ala Tyr Ala Ala Ala Asn Ala Tyr Leu Asp Ala Leu Ala Glu Gln Arg		
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Arg Ala Arg Gly Leu Val Gly Thr Ala Val Ala Trp Gly Pro Trp Ala		
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Gly Asp Gly Met Ala Ala Gly Glu Thr Gly Ala Gln Leu His Arg Met		
2915	2920	2925
Gly Leu Ala Ser Met Glu Pro Ser Ala Ala Leu Leu Ala Leu Gln Gly		

2930

2935

2940

Ala Leu Asp Arg Asp Glu Thr Ser Leu Val Val Ala Asp Val Asp Trp
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Ala Arg Phe Ala Pro Ala Phe Thr Ser Ala Arg Arg Arg Pro Leu Leu
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Asp Thr Ile Asp Glu Ala Arg Ala Ala Leu Glu Thr Thr Gly Glu Gln
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Ala Gly Thr Gly Lys Pro Val Glu Leu Thr Gln Arg Leu Ala Gly Leu
 2995 3000 3005

Ser Arg Lys Glu Arg Asp Asp Ala Val Leu Asp Leu Val Arg Ala Glu
 3010 3015 3020

Thr Ala Ala Val Leu Gly Arg Asp Asp Ala Thr Ala Leu Ala Pro Ser
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 3045 3050 3055

Arg Asn Arg Leu Asn Thr Ala Thr Gly Ile Gln Leu Pro Ala Ser Thr
 3060 3065 3070

Ile Phe Asp Tyr Pro Asn Ala Glu Ser Leu Ser Arg His Leu Cys Ala
 3075 3080 3085

Glu Leu Phe Pro Thr Glu Thr Thr Val Asp Ser Ala Leu Ala Glu Leu
 3090 3095 3100

Asp Arg Ile Glu Gln Gln Leu Ser Met Leu Thr Gly Glu Ala Arg Ala
 105 3110 3115 3120

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 3125 3130 3135

Ser Ala Ala Glu Val Pro Thr Gly Ala Asp Val Leu Ser Thr Leu Asp
 3140 3145 3150

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Leu Ser
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WO 01/16303

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<220>

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 Asp Leu His Gln Thr Arg Gln Arg Leu Leu Ala Ala Glu Ser Arg Ser
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cag gag ccg atc gcg atc gtc tgc gcg agc tgc cga ctg ccc ggc ggc 144
 Gln Glu Pro Ile Ala Ile Val Ser Ala Ser Cys Arg Leu Pro Gly Gly
 35 40 45

gtc gac tct ccc gaa gcg ctc tgg caa ctc gtg cgc act ggc acc gac 192
 Val Asp Ser Pro Glu Ala Leu Trp Gln Leu Val Arg Thr Gly Thr Asp
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gcc atc tgc gag ttc ccc gcc gac cgg ggc tgg gat ctc ggc cgg ttg 240
 Ala Ile Ser Glu Phe Pro Ala Asp Arg Gly Trp Asp Leu Gly Arg Leu
 65 70 75 80

tac gat ccc gac ccg aac cac cag gga acg tgc tac acg cgg gcc ggc 288
 Tyr Asp Pro Asp Pro Asn His Gln Gly Thr Ser Tyr Thr Arg Ala Gly
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 Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg Leu Leu Leu
 115 120 125

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 Glu Leu Ser Trp Glu Ala Leu Glu Arg Ala Gly Ile Asp Pro Thr Ser
 130 135 140

ctg cgc ggc agc aag acc ggt gtc ttc ggt ggt gtc acg ccc cag gag	480
Leu Arg Gly Ser Lys Thr Gly Val Phe Gly Gly Val Thr Pro Gln Glu	
145 150 155 160	
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Tyr Gly Pro Ser Leu Gln Glu Met Ser Arg Asn Ala Gly Gly Phe Gly	
165 170 175	
ctc acc ggg cgg atg gtg agt gtg gcg tcg ggt cgg gtt gcg tat tcg	576
Leu Thr Gly Arg Met Val Ser Val Ala Ser Gly Arg Val Ala Tyr Ser	
180 185 190	
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Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser	
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Ser Leu Val Ala Leu His Leu Ala Cys Gln Ser Leu Arg Ser Gly Glu	
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tgc gat ctc gcg ctg gcc ggc ggt gtg acg gtg atg gcg aca ccg gcg	720
Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met Ala Thr Pro Ala	
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Thr Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala Pro Asp Gly Arg	
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Cys Lys Ser Phe Ala Ala Ala Ala Asp Gly Thr Gly Trp Gly Glu Gly	
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Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly	
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His Glu Val Leu Ala Val Val Arg Gly Ser Ala Val Asn Gln Asp Gly	
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gcg tcg aat ggt ttg act gcg ccg aat ggt ccg tcg cag cag cgg gtg	960
Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ser Gln Gln Arg Val	
305 310 315 320	
atc acc cag gcg ttg gcg agt gcg ggg ctg tcg gtt tcc gat gtg gat	1008
Ile Thr Gln Ala Leu Ala Ser Ala Gly Leu Ser Val Ser Asp Val Asp	
325 330 335	

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Ala Val Glu Ala His Gly Thr Gly Thr Leu Gly Asp Pro Ile Glu	
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Ala Gln Ala Leu Ile Ala Thr Tyr Gly Gln Gly Arg Glu Lys Asp Arg	
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Pro Asp Ser Gly Arg Pro Cys Arg Val Gly Val Ser Ser Phe Gly Ile	
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Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Ser Pro Val Glu Gln	
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Gly Glu Pro Ala Gly Pro Val Glu Gly Glu Arg Glu Pro Asp Val Ala	
465 470 475 480	
gtc ccc gtg gtg cct tgg gtg ctg tcg ggt aag aca ccg gag gct gcg	1488
Val Pro Val Val Pro Trp Val Leu Ser Gly Lys Thr Pro Glu Ala Ala	
485 490 495	
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Arg Ala Gln Ala Glu Arg Val His Ser His Ile Glu Asp Arg Pro Gly	
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Leu Ser Pro Val Asp Val Ala Tyr Ser Leu Gly Met Thr Arg Ala Ala	
515 520 525	

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Leu Asp Glu Arg Ala Val Val Leu Gly Ser Asp Arg Ala Ala Leu Leu	
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Thr Gly Leu Arg Ala Phe Ala Asp Gly Cys Asp Ala Pro Glu Val Val	
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Ser Gly Ser Val Gly Leu Gly Gly Arg Val Gly Phe Val Phe Ser Gly	
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Gln Gly Gly Gln Trp Pro Gly Met Gly Arg Gly Leu Tyr Ser Val Phe	
580 585 590	
ccg gtg ttc gcc gac gcg ttc gac gag gct tgc gcg gag ttg gat gca	1824
Pro Val Phe Ala Asp Ala Phe Asp Glu Ala Cys Ala Glu Leu Asp Ala	
595 600 605	
cac ctg ggc cag gaa ctg cgg gtt cgg gat gtg gtg ttc ggt tcg caa	1872
His Leu Gly Gln Glu Leu Arg Val Arg Asp Val Val Phe Gly Ser Gln	
610 615 620	
gcg tgg ttg ctg gat cgg acg gtg tgg gcg cag tcg ggt ttg ttc gcg	1920
Ala Trp Leu Leu Asp Arg Thr Val Trp Ala Gln Ser Gly Leu Phe Ala	
625 630 635 640	
ttg cag att ggc ttg ctg cgg ctg ctg ggt tcg tgg ggt gtt cgg ccg	1968
Leu Gln Ile Gly Leu Leu Arg Leu Leu Gly Ser Trp Gly Val Arg Pro	
645 650 655	
gat gtg gtg ttg ggg cac tcg gtg ggt gag ctg gct gcg gtg cat gcg	2016
Asp Val Val Leu Gly His Ser Val Gly Glu Leu Ala Ala Val His Ala	
660 665 670	
gct ggt gtg ttg tcg ttg tcg gag gcc gcg cgg ttg gtg gcg ggt cgc	2064
Ala Gly Val Leu Ser Leu Ser Glu Ala Ala Arg Leu Val Ala Gly Arg	
675 680 685	
gcc cgg ttg atg cag gcg ttg cct tct ggt ggt gcc atg ctc gcg gtc	2112
Ala Arg Leu Met Gln Ala Leu Pro Ser Gly Gly Ala Met Leu Ala Val	
690 695 700	
gct acg ggt gag ttt cag gtc gat cct ctg ctg gat ggg gtg cgg gac	2160
Ala Thr Gly Glu Phe Gln Val Asp Pro Leu Leu Asp Gly Val Arg Asp	
705 710 715 720	

cgg atc ggt atc gcg gcg gtg aat ggc ccg gaa tcg gtt gtg ctc tct	2208
Arg Ile Gly Ile Ala Ala Val Asn Gly Pro Glu Ser Val Val Leu Ser	
725 730 735	
ggt gac cgc gag ctg ctc acc gag atc gct gat cgg ttg cac gat cag	2256
Gly Asp Arg Glu Leu Leu Thr Glu Ile Ala Asp Arg Leu His Asp Gln	
740 745 750	
ggg tgc cgg acc cgg tgg ttg cgg gtg tcg cat gct ttc cat tcg ccc	2304
Gly Cys Arg Thr Arg Trp Leu Arg Val Ser His Ala Phe His Ser Pro	
755 760 765	
cat atg gag ccg atg ctg gag gag ttc gcc cag atc tcc cga ggc cgc	2352
His Met Glu Pro Met Leu Glu Glu Phe Ala Gln Ile Ser Arg Gly Arg	
770 775 780	
gaa tat cac gca ccg gaa ctg ccg atc atc tcg acc ctg atc ggt gag	2400
Glu Tyr His Ala Pro Glu Leu Pro Ile Ile Ser Thr Leu Ile Gly Glu	
785 790 795 800	
ctg gac ggt ggt cga gtg atg ggc act ccc gag tac tgg gtg cgt cag	2448
Leu Asp Gly Gly Arg Val Met Gly Thr Pro Glu Tyr Trp Val Arg Gln	
805 810 815	
gtg cgt gag ccc gtc cgt ttc gcc gag ggt gtc cag gcg ctt gtc ggt	2496
Val Arg Glu Pro Val Arg Phe Ala Glu Gly Val Gln Ala Leu Val Gly	
820 825 830	
cag ggt gtc ggc acg att gtc gaa ttg ggt ccg gac ggg gcg ttg tcg	2544
Gln Gly Val Gly Thr Ile Val Glu Leu Gly Pro Asp Gly Ala Leu Ser	
835 840 845	
acg ttg gtc gag gag tgt gtg gcg gaa tcc ggg cgg gtg gcc ggg atc	2592
Thr Leu Val Glu Glu Cys Val Ala Glu Ser Gly Arg Val Ala Gly Ile	
850 855 860	
ccg ctg atg cgc aag gac cgc gac gag gcg cga acc gtg ctg gca gct	2640
Pro Leu Met Arg Lys Asp Arg Asp Glu Ala Arg Thr Val Leu Ala Ala	
865 870 875 880	
ttg gcg cag atc cac acc cgt ggt ggt gag gtg gac tgg cgg tcg ttt	2688
Leu Ala Gln Ile His Thr Arg Gly Gly Glu Val Asp Trp Arg Ser Phe	
885 890 895	
ttc gcc ggt acc ggg gcg aag caa gtc gac ctg ccc acc tac gcc ttc	2736
Phe Ala Gly Thr Gly Ala Lys Gln Val Asp Leu Pro Thr Tyr Ala Phe	
900 905 910	

cag cgg cag cgg tac tgg ctg gca tcc acc ggg cgt gcg ggt gac gtg	2784
Gln Arg Gln Arg Tyr Trp Leu Ala Ser Thr Gly Arg Ala Gly Asp Val	
915 920 925	
acc gcc gcc gga ttg gcc gag gcg gac cat ccg ctg ctc ggt gcg gtg	2832
Thr Ala Ala Gly Leu Ala Glu Ala Asp His Pro Leu Leu Gly Ala Val	
930 935 940	
gtt gcg ttg gca gac ggc gaa ggt gtg gtg ctg acc ggt cgg ttg aca	2880
Val Ala Leu Ala Asp Gly Glu Gly Val Val Leu Thr Gly Arg Leu Thr	
945 950 955 960	
gcg ggt tcg cat ccg tgg ttg tcc gat cac cgg gtg ctg ggc gaa atc	2928
Ala Gly Ser His Pro Trp Leu Ser Asp His Arg Val Leu Gly Glu Ile	
965 970 975	
gtc gtc ccc ggc acc gcg atc gtc gag ctg gtg tgg cac gtc ggc gag	2976
Val Val Pro Gly Thr Ala Ile Val Glu Leu Val Trp His Val Gly Glu	
980 985 990	
cgc ctc ggt tgt ggc cgg gtg gaa gaa ctg gct ttg gaa gcg ccc ctg	3024
Arg Leu Gly Cys Gly Arg Val Glu Glu Leu Ala Leu Glu Ala Pro Leu	
995 1000 1005	
atc ctg ccg gat cat gga gcg gtc cag gtt cag gtg ctg gtg gga ccg	3072
Ile Leu Pro Asp His Gly Ala Val Gln Val Gln Val Leu Val Gly Pro	
1010 1015 1020	
ccc ggg gaa tcc gga gcc cgg tcg gtg gcg ctc tac tcc tgt cct ggc	3120
Pro Gly Glu Ser Gly Ala Arg Ser Val Ala Leu Tyr Ser Cys Pro Gly	
1025 1030 1035 1040	
gag gcg atc gaa ccc gag tgg aag aag cac gcg acg ggc gtg ctt ctc	3168
Glu Ala Ile Glu Pro Glu Trp Lys Lys His Ala Thr Gly Val Leu Leu	
1045 1050 1055	
cca ccc gtg gcc gcc gag aac cat gag ctg acc gca tgg ccc ccg gag	3216
Pro Pro Val Ala Ala Glu Asn His Glu Leu Thr Ala Trp Pro Pro Glu	
1060 1065 1070	
aat gcg acc gaa atc gat gca gac ggg gtc tac gca ttc ctt gaa ggg	3264
Asn Ala Thr Glu Ile Asp Ala Asp Gly Val Tyr Ala Phe Leu Glu Gly	
1075 1080 1085	
cac ggt ttc gcg tac gga ccg gcc ttt aga tgt ctg cgc ggt gcc tgg	3312
His Gly Phe Ala Tyr Gly Pro Ala Phe Arg Cys Leu Arg Gly Ala Trp	
1090 1095 1100	

232

gcc caa gag tgc acc tcc gat ctg ctg gct ctc gtg cag tgc tgg ctt 3936
 Ala Gln Glu Ser Thr Ser Asp Leu Leu Ala Leu Val Gln Ser Trp Leu
 1300 1305 1310

gcg gac gag cgg ttc gcc gaa tcc cag ctc gtg gtc gtc acg cgt gca 3984
 Ala Asp Glu Arg Phe Ala Glu Ser Gln Leu Val Val Val Thr Arg Ala
 1315 1320 1325

gcg gtg tgc gcc gac tgc gat tgc gac gtc gcg gac ctg gtg ggt gcg 4032
 Ala Val Ser Ala Asp Ser Asp Ser Asp Val Ala Asp Leu Val Gly Ala
 1330 1335 1340

tgc tgc tgg ggg ttg ttg agt tca gcc cag tgc gag aac ccg ggt cgc 4080
 Ser Ser Trp Gly Leu Leu Ser Ser Ala Gln Ser Glu Asn Pro Gly Arg
 1345 1350 1355 1360

ttc gtg ctg gtg gac gtg gac ggc aca cct gag tgc tgg cag gcg ttg 4128
 Phe Val Leu Val Asp Val Asp Gly Thr Pro Glu Ser Trp Gln Ala Leu
 1365 1370 1375

ccg gcc gcc gtg cga gca gga gaa ccg cag ctg gca ctt cgg cgc ggc 4176
 Pro Ala Ala Val Arg Ala Gly Glu Pro Gln Leu Ala Leu Arg Arg Gly
 1380 1385 1390

gtg gcg ctg gtg cct cgg ttg gcg cga ctc acg gtg cgc gag gag ggc 4224
 Val Ala Leu Val Pro Arg Leu Ala Arg Leu Thr Val Arg Glu Glu Gly
 1395 1400 1405

tcc tcc ccg caa ctc gac acg gac ggg acc gtc ctc atc acg ggt ggc 4272
 Ser Ser Pro Gln Leu Asp Thr Asp Gly Thr Val Leu Ile Thr Gly Gly
 1410 1415 1420

acc ggt gcg ttg ggg gga gtg gtt gcc cgt cac ctg gtg gag gag cac 4320
 Thr Gly Ala Leu Gly Gly Val Val Ala Arg His Leu Val Glu Glu His
 1425 1430 1435 1440

ggg att ccg cgt ttg gtg ttg gca ggc ccg cgt ggc tgg aat gcg cct 4368
 Gly Ile Arg Arg Leu Val Leu Ala Gly Arg Arg Gly Trp Asn Ala Pro
 1445 1450 1455

gga gtc cac gag ttg gtg gat gag ctg gcg cgc gcg ggc gcc gtg gtt 4416
 Gly Val His Glu Leu Val Asp Glu Leu Ala Arg Ala Gly Ala Val Val
 1460 1465 1470

gag gtg gtg gct tgc gat gtg gct gac cgc acc gat ctg gag cac gtg 4464
 Glu Val Val Ala Cys Asp Val Ala Asp Arg Thr Asp Leu Glu His Val
 1475 1480 1485

ctg gcc gcc att ccg gtc gac tgg ccg ctg cgg ggg atc gtg cat acc	4512
Leu Ala Ala Ile Pro Val Asp Trp Pro Leu Arg Gly Ile Val His Thr	
1490 1495 1500	
gct ggg gtg ctg gcc gac gga gtg atc ggg tcc ttg tcg gcg gcg gat	4560
Ala Gly Val Leu Ala Asp Gly Val Ile Gly Ser Leu Ser Ala Ala Asp	
1505 1510 1515 1520	
gtg ggc acg gtg ttt gcc ccg aag gtg acg ggg gca tgg cat ctg cac	4608
Val Gly Thr Val Phe Ala Pro Lys Val Thr Gly Ala Trp His Leu His	
1525 1530 1535	
gag ttg acc cgc gat ctg gat ctg tcg ttc ttc gtt ctt ttc tct tcc	4656
Glu Leu Thr Arg Asp Leu Asp Leu Ser Phe Phe Val Leu Phe Ser Ser	
1540 1545 1550	
ttc tcc ggg att gcg ggt gcc gca ggg cag gcc aac tac gcg gcg gcg	4704
Phe Ser Gly Ile Ala Gly Ala Ala Gly Gln Ala Asn Tyr Ala Ala Ala	
1555 1560 1565	
aac acg ttc ctg gat gca ttg gcg cgt tat cgc cgg gcg cgt ggg ctg	4752
Asn Thr Phe Leu Asp Ala Leu Ala Arg Tyr Arg Arg Ala Arg Gly Leu	
1570 1575 1580	
cct ggg ttg tcg ttg gcg tgg gga ctg tgg gcg caa ccc agc ggt atg	4800
Pro Gly Leu Ser Leu Ala Trp Gly Leu Trp Ala Gln Pro Ser Gly Met	
1585 1590 1595 1600	
acg agt ggc ttg gac gcg gcg tcg gtg gag cgg ttg gcg cgg acg ggc	4848
Thr Ser Gly Leu Asp Ala Ala Ser Val Glu Arg Leu Ala Arg Thr Gly	
1605 1610 1615	
atc gca gaa ctt tcc acg gag gat gga ctc cgc ctg ttc gat gcc gcg	4896
Ile Ala Glu Leu Ser Thr Glu Asp Gly Leu Arg Leu Phe Asp Ala Ala	
1620 1625 1630	
ttc gcg aag gac cgg gct tgc gtc gtt gcc gct cga ttg gac agg gcg	4944
Phe Ala Lys Asp Arg Ala Cys Val Val Ala Ala Arg Leu Asp Arg Ala	
1635 1640 1645	
ctg ctg gtc ggg aac gga cga tcg cac gcg att ccg gcg ctg ttg agc	4992
Leu Leu Val Gly Asn Gly Arg Ser His Ala Ile Pro Ala Leu Leu Ser	
1650 1655 1660	
gcg ttg gtt cct gtt cgc ggc ggt gtg gcg agg aaa aca gcc aat tct	5040
Ala Leu Val Pro Val Arg Gly Gly Val Ala Arg Lys Thr Ala Asn Ser	
1665 1670 1675 1680	

cag gcc gcg gat gag gac gca ctg ttg ggt ttg gtg cgg gag cac gtt	5088
Gln Ala Ala Asp Glu Asp Ala Leu Leu Gly Leu Val Arg Glu His Val	
1685 1690 1695	
tcg gcc gtg ctg ggt tat tcg ggt gcg gtc gag gtt ggg ggc gac cgt	5136
Ser Ala Val Leu Gly Tyr Ser Gly Ala Val Glu Val Gly Gly Asp Arg	
1700 1705 1710	
gct ttc cgt gat ctg ggt ttt gat tcg ttg tct ggc gtg gag ttg cgg	5184
Ala Phe Arg Asp Leu Gly Phe Asp Ser Leu Ser Gly Val Glu Leu Arg	
1715 1720 1725	
aac cgc ctt gcc ggg gtg ctg ggg gtg cgg ttg ccg gcg act gcg gtg	5232
Asn Arg Leu Ala Gly Val Leu Gly Val Arg Leu Pro Ala Thr Ala Val	
1730 1735 1740	
ttc gac tat ccg acg ccg cgg gcg ctg gcg cgt ttc ctg cat cag gaa	5280
Phe Asp Tyr Pro Thr Pro Arg Ala Leu Ala Arg Phe Leu His Gln Glu	
1745 1750 1755 1760	
ctg gca ggc gag gtc gcg tcc acg tcg acg ccg gtg acc agg gca gcg	5328
Leu Ala Gly Glu Val Ala Ser Thr Ser Thr Pro Val Thr Arg Ala Ala	
1765 1770 1775	
agt gcc gaa gag gat ctt gtt gcg att gtc ggg atg gga tgt cgt ttt	5376
Ser Ala Glu Glu Asp Leu Val Ala Ile Val Gly Met Gly Cys Arg Phe	
1780 1785 1790	
ccg ggt ggg gtg tcg tcg ccg gag gag ctt tgg cgg ctg gtg gcc ggc	5424
Pro Gly Gly Val Ser Ser Pro Glu Glu Leu Trp Arg Leu Val Ala Gly	
1795 1800 1805	
ggc gtg gat gcg gtg gct ggg ttc cca gac gat cgc ggc tgg gat ctc	5472
Gly Val Asp Ala Val Ala Gly Phe Pro Asp Asp Arg Gly Trp Asp Leu	
1810 1815 1820	
gcg gcg ttg tac gat cct gat ccc gat cgt ctc ggg acc tcg tat gtg	5520
Ala Ala Leu Tyr Asp Pro Asp Pro Asp Arg Leu Gly Thr Ser Tyr Val	
1825 1830 1835 1840	
tgt gag ggc ggg ttt ctg cgg gac gcg gcg gag ttc gat gct gac atg	5568
Cys Glu Gly Gly Phe Leu Arg Asp Ala Ala Glu Phe Asp Ala Asp Met	
1845 1850 1855	
ttc ggc atc agc ccg cgt gag gcg ttg gcg atg gat ccg cag cag cgg	5616
Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg	
1860 1865 1870	

ttg ctg ctg gag gtc gcc tgg gaa acc ttg gag cgg gct ggg atc gat	5664
Leu Leu Leu Glu Val Ala Trp Glu Thr Leu Glu Arg Ala Gly Ile Asp	
1875 1880 1885	
ccg ttc tcg ttg cac ggc agc cgg acc ggt gtg ttc gcg ggc ttg atg	5712
Pro Phe Ser Leu His Gly Ser Arg Thr Gly Val Phe Ala Gly Leu Met	
1890 1895 1900	
tac cac gac tat ggg gcc cga ttc att acc aga gca ccg gag ggc ttc	5760
Tyr His Asp Tyr Gly Ala Arg Phe Ile Thr Arg Ala Pro Glu Gly Phe	
1905 1910 1915 1920	
gaa ggg cac ctc ggg acg ggc aat gcg ggg agc gtg ctg tcg ggt cgg	5808
Glu Gly His Leu Gly Thr Gly Asn Ala Gly Ser Val Leu Ser Gly Arg	
1925 1930 1935	
gtt gcg tat tcg ttt ggt ttc gag ggt cct gcg gtg acg gtg gat acg	5856
Val Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr	
1940 1945 1950	
gcg tgt tcg tcg tcg ttg gtg gcg tta cac ctg gcg ggt caa gca ctg	5904
Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ala Leu	
1955 1960 1965	
cgg gcc ggt gag tgc gaa ttc gcc ctt gcc ggt ggc gtc acg gtg atg	5952
Arg Ala Gly Glu Cys Glu Phe Ala Leu Ala Gly Gly Val Thr Val Met	
1970 1975 1980	
tcg acg ccg acg acg ttc gtg gag ttc tcc cgt caa cgg ggt ctg gct	6000
Ser Thr Pro Thr Thr Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala	
1985 1990 1995 2000	
ccg gat ggg cgg tgc aag tcg ttc gcg gcg gcc gcg gat ggc acc ggg	6048
Pro Asp Gly Arg Cys Lys Ser Phe Ala Ala Ala Asp Gly Thr Gly	
2005 2010 2015	
tgg ggc gag ggt gcc ggt ctg gtg ttg ctg gag cgg ttg tcg gat gcc	6096
Trp Gly Glu Gly Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp Ala	
2020 2025 2030	
cgg cgc aat ggg cac gag gtt ctg gcg gtg gtg cgg ggt agc gcg gtg	6144
Arg Arg Asn Gly His Glu Val Leu Ala Val Val Arg Gly Ser Ala Val	
2035 2040 2045	
aac cag gac ggc gcg tcg aat ggc ttg act gcg cca aat ggt ccg tca	6192
Asn Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ser	
2050 2055 2060	

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gat gct tcc ccg cga gat atc ggt tat tcg ctt gcg gtg acc cgt ccg	6816
Asp Ala Ser Pro Arg Asp Ile Gly Tyr Ser Leu Ala Val Thr Arg Pro	
2260 2265 2270	
gcg ttg gac cac cgc gct gtc gtg ctg ggt gcg gat cgt gcc gcg ttg	6864
Ala Leu Asp His Arg Ala Val Val Leu Gly Ala Asp Arg Ala Ala Leu	
2275 2280 2285	
ctg ccg ggc ttg aaa gcg ctg gcc gtt agt aat gac gct gcc gag gtg	6912
Leu Pro Gly Leu Lys Ala Leu Ala Val Ser Asn Asp Ala Ala Glu Val	
2290 2295 2300	
atc acc ggc act cgt gcc gct ggg ccg gtc gga ttc gtg ttc tcc ggt	6960
Ile Thr Gly Thr Arg Ala Ala Gly Pro Val Gly Phe Val Phe Ser Gly	
2305 2310 2315 2320	
caa ggt ggt cag tgg ccc ggg atg gga agc ggg ctc cac tcg gcg ttt	7008
Gln Gly Gly Gln Trp Pro Gly Met Gly Ser Gly Leu His Ser Ala Phe	
2325 2330 2335	
ccg gtg ttc gcc gac gcg ttt gac gaa gcc tgc tgc gag ctg gat gcg	7056
Pro Val Phe Ala Asp Ala Phe Asp Glu Ala Cys Cys Glu Leu Asp Ala	
2340 2345 2350	
cat ctc ggg cag atg gcc cgg cta cga gat gtg ttg tcc ggt tcg gat	7104
His Leu Gly Gln Met Ala Arg Leu Arg Asp Val Leu Ser Gly Ser Asp	
2355 2360 2365	
acg caa ctt ctg gac cag acc ttg tgg gcg cag ccg ggc ctg ttc gcg	7152
Thr Gln Leu Leu Asp Gln Thr Leu Trp Ala Gln Pro Gly Leu Phe Ala	
2370 2375 2380	
ttg caa gtc gga ctc tgg gag ttg ttg ggt tcg tgg ggt gtc cgg ccc	7200
Leu Gln Val Gly Leu Trp Glu Leu Leu Gly Ser Trp Gly Val Arg Pro	
2385 2390 2395 2400	
gct gtg gtg ctg ggc cac tcg gtc ggt gag ctg gcg gcg gcg ttc gcg	7248
Ala Val Val Leu Gly His Ser Val Gly Glu Leu Ala Ala Ala Phe Ala	
2405 2410 2415	
gct gga gtg ttg tcg ttg cgg gat gcg gct cgg ctg gtg gcg ggc cgt	7296
Ala Gly Val Leu Ser Leu Arg Asp Ala Ala Arg Leu Val Ala Gly Arg	
2420 2425 2430	
gcc cgg ttg atg caa gcc ctg cca act ggc ggt gcc atg ctc gct gcg	7344
Ala Arg Leu Met Gln Ala Leu Pro Thr Gly Gly Ala Met Leu Ala Ala	
2435 2440 2445	

gct gct gga gag gag cag ctg cgc ccg ttg ctg gcc gac tgc ggt gat	7392
Ala Ala Gly Glu Glu Gln Leu Arg Pro Leu Leu Ala Asp Cys Gly Asp	
2450 2455 2460	
cgT gtg ggg atc gcc gcg gtc aac gct ccc ggg tcg gtg gtg ctc tcc	7440
Arg Val Gly Ile Ala Ala Val Asn Ala Pro Gly Ser Val Val Leu Ser	
2465 2470 2475 2480	
ggt gat cgg gat gtg ctc gat gac att gcc ggt cgg ctg gac ggg caa	7488
Gly Asp Arg Asp Val Leu Asp Asp Ile Ala Gly Arg Leu Asp Gly Gln	
2485 2490 2495	
ggg atc cgg tcc agg tgg ttg cgg gtt tcg cat gcg ttt cat tcg cat	7536
Gly Ile Arg Ser Arg Trp Leu Arg Val Ser His Ala Phe His Ser His	
2500 2505 2510	
cgg atg gat ccg atg ctg gcg gag ttc acc gaa atc gcc cgg agc gtg	7584
Arg Met Asp Pro Met Leu Ala Glu Phe Thr Glu Ile Ala Arg Ser Val	
2515 2520 2525	
gac tac cgg tcg tca ggg ctg ccg atc gtg tcg acg ttg acg ggt gag	7632
Asp Tyr Arg Ser Ser Gly Leu Pro Ile Val Ser Thr Leu Thr Gly Glu	
2530 2535 2540	
ctc gat gag gtc gcc atg ccg gct acg ccg gag tat tgg gtg cgc cag	7680
Leu Asp Glu Val Gly Met Pro Ala Thr Pro Glu Tyr Trp Val Arg Gln	
2545 2550 2555 2560	
gtg cga gaa ccc gtc cgc ttc gcc gac ggt gtt gct gcg ctc gcg gct	7728
Val Arg Glu Pro Val Arg Phe Ala Asp Gly Val Ala Ala Leu Ala Ala	
2565 2570 2575	
cac ggt gtg agc acc gtc gtc gag gtc ggt ccg gat ggg gtg ttg tcg	7776
His Gly Val Ser Thr Val Val Glu Val Gly Pro Asp Gly Val Leu Ser	
2580 2585 2590	
gcg ctg gtg cag gag tgc gcg gcc gga tcc gat cag gcc gga cgg gtg	7824
Ala Leu Val Gln Glu Cys Ala Ala Gly Ser Asp Gln Gly Gly Arg Val	
2595 2600 2605	
gcc gcg gtt ccg ctc atg cgc agc aat cgc gac gag gcg cac acg gtg	7872
Ala Ala Val Pro Leu Met Arg Ser Asn Arg Asp Glu Ala His Thr Val	
2610 2615 2620	
aca acg gca ttg gcg cag atc cat gtg cgt ggt gct gag gtg gac tgg	7920
Thr Thr Ala Leu Ala Gln Ile His Val Arg Gly Ala Glu Val Asp Trp	
2625 2630 2635 2640	

cgg tcg ttt ttc gcc ggt acc ggg gca aag cag gtc gag ctg ccc acg	7968
Arg Ser Phe Phe Ala Gly Thr Gly Ala Lys Gln Val Glu Leu Pro Thr	
2645 2650 2655	
tat gcc ttc caa cga cag cgg tac tgg ctt gac tca cca tcc gaa ccg	8016
Tyr Ala Phe Gln Arg Gln Arg Tyr Trp Leu Asp Ser Pro Ser Glu Pro	
2660 2665 2670	
gtc ggg caa tcc gcc gat ccc gcg cgc cag tcg ggc ttc tgg gaa ctc	8064
Val Gly Gln Ser Ala Asp Pro Ala Arg Gln Ser Gly Phe Trp Glu Leu	
2675 2680 2685	
gtc gag cag gaa gat gtc agc gcg ctc agc gcc gct ctg cac att acc	8112
Val Glu Gln Glu Asp Val Ser Ala Leu Ser Ala Ala Leu His Ile Thr	
2690 2695 2700	
ggc gat cac gac gtg cag gcg tcc ctg gaa tcg gtg gtt ccg gtc ctc	8160
Gly Asp His Asp Val Gln Ala Ser Leu Glu Ser Val Val Pro Val Leu	
2705 2710 2715 2720	
tcc tcc tgg cat cgc cgg atc cgc aac gaa tcc ctg gtg cac cag tgg	8208
Ser Ser Trp His Arg Arg Ile Arg Asn Glu Ser Leu Val His Gln Trp	
2725 2730 2735	
cgg tac cgg att tcc tgg cat gag cgg gca gat ttg cca gac ccc tcg	8256
Arg Tyr Arg Ile Ser Trp His Glu Arg Ala Asp Leu Pro Asp Pro Ser	
2740 2745 2750	
ttg tcg ggg aca tgg ctc gtc gtc gtg ccg gag ggg tgg tcg gcg agt	8304
Leu Ser Gly Thr Trp Leu Val Val Val Pro Glu Gly Trp Ser Ala Ser	
2755 2760 2765	
cgg caa gtt ctg cgt ttc aac gag atg ttc gag gaa cgg ggt tgc ccg	8352
Arg Gln Val Leu Arg Phe Asn Glu Met Phe Glu Glu Arg Gly Cys Pro	
2770 2775 2780	
gca gtt ctg ttc gag ctc gcc ggg cac gac gag gaa gcc ctg gcg caa	8400
Ala Val Leu Phe Glu Leu Ala Gly His Asp Glu Glu Ala Leu Ala Gln	
2785 2790 2795 2800	
cga ttc cgc tcg ttg cct gtt gcg tca ggg gga ata agc ggc gtg ttg	8448
Arg Phe Arg Ser Leu Pro Val Ala Ser Gly Gly Ile Ser Gly Val Leu	
2805 2810 2815	
tcc ttg ctg gcg ctg gat gaa tcg ccg tcc tcg ccg aac gct gct ttg	8496
Ser Leu Leu Ala Leu Asp Glu Ser Pro Ser Ser Pro Asn Ala Ala Leu	
2820 2825 2830	

ccg aat ggc gcg ctg aac tcg ttg gta ctg ctg cga gct ctg cgg gcc 8544
 Pro Asn Gly Ala Leu Asn Ser Leu Val Leu Leu Arg Ala Leu Arg Ala
 2835 2840 2845

gcg gat gtg tcg gcg cca ttg tgg ttg gcg acg tgt ggt ggt gtc gcg 8592
 Ala Asp Val Ser Ala Pro Leu Trp Leu Ala Thr Cys Gly Gly Val Ala
 2850 2855 2860

gtc ggg gat gtg ccg gtg aac ccg ggg cag gcg ctg gtg tgg gga ctg 8640
 Val Gly Asp Val Pro Val Asn Pro Gly Gln Ala Leu Val Trp Gly Leu
 2865 2870 2875 2880

ggt cgc gtc gtc ggt ctg gag cat ccg gcc tgg tgg ggt ggc ctg gtc 8688
 Gly Arg Val Val Gly Leu Glu His Pro Ala Trp Trp Gly Gly Leu Val
 2885 2890 2895

gac gtg ccg tgc ttg ctc gat gag gac gct cga gaa cgc ttg tcg gtc 8736
 Asp Val Pro Cys Leu Leu Asp Glu Asp Ala Arg Glu Arg Leu Ser Val
 2900 2905 2910

gtg ttg gca ggt ctt ggc gag gac gag atc gcg gta cgt ccc ggt ggt 8784
 Val Leu Ala Gly Leu Gly Glu Asp Glu Ile Ala Val Arg Pro Gly Gly
 2915 2920 2925

gtg ttc gtg cgg cgg ttg gaa cgc gct ggt gcg gcg tcg ggt gcc ggg 8832
 Val Phe Val Arg Arg Leu Glu Arg Ala Gly Ala Ala Ser Gly Ala Gly
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 His Val Val Leu Thr Ser Arg Arg Gly Ala Ala Ala Pro Gly Ala Gly
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<400> 48

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Gln Glu Pro Ile Ala Ile Val Ser Ala Ser Cys Arg Leu Pro Gly Gly
 35 40 45

Val Asp Ser Pro Glu Ala Leu Trp Gln Leu Val Arg Thr Gly Thr Asp
 50 55 60

Ala Ile Ser Glu Phe Pro Ala Asp Arg Gly Trp Asp Leu Gly Arg Leu
 65 70 75 80

Tyr Asp Pro Asp Pro Asn His Gln Gly Thr Ser Tyr Thr Arg Ala Gly
 85 90 95

Gly Phe Leu Ala Gly Ala Gly Asp Phe Asp Pro Ala Met Phe Gly Ile
 100 105 110

Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg Leu Leu Leu
 115 120 125

Glu Leu Ser Trp Glu Ala Leu Glu Arg Ala Gly Ile Asp Pro Thr Ser
 130 135 140

Leu Arg Gly Ser Lys Thr Gly Val Phe Gly Gly Val Thr Pro Gln Glu
 145 150 155 160

Tyr Gly Pro Ser Leu Gln Glu Met Ser Arg Asn Ala Gly Gly Phe Gly
 165 170 175

Leu Thr Gly Arg Met Val Ser Val Ala Ser Gly Arg Val Ala Tyr Ser
 180 185 190

Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser
 195 200 205

Ser Leu Val Ala Leu His Leu Ala Cys Gln Ser Leu Arg Ser Gly Glu
 210 215 220

Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met Ala Thr Pro Ala
 225 230 235 240

Thr Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala Pro Asp Gly Arg
 245 250 255
 Cys Lys Ser Phe Ala Ala Ala Ala Asp Gly Thr Gly Trp Gly Glu Gly
 260 265 270
 Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly
 275 280 285
 His Glu Val Leu Ala Val Val Arg Gly Ser Ala Val Asn Gln Asp Gly
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 Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ser Gln Gln Arg Val
 305 310 315 320
 Ile Thr Gln Ala Leu Ala Ser Ala Gly Leu Ser Val Ser Asp Val Asp
 325 330 335
 Ala Val Glu Ala His Gly Thr Gly Thr Thr Leu Gly Asp Pro Ile Glu
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 Ala Gln Ala Leu Ile Ala Thr Tyr Gly Gln Gly Arg Glu Lys Asp Arg
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 Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile Gly His Thr Gln Ala
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 Ala Ala Gly Val Ala Gly Val Ile Lys Met Val Leu Ala Met Arg His
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 Gly Gln Leu Pro Ala Thr Leu His Val Asp Glu Pro Thr Ser Ala Val
 405 410 415
 Asp Trp Ser Ala Gly Ser Val Arg Leu Leu Thr Glu Asn Thr Pro Trp
 420 425 430
 Pro Asp Ser Gly Arg Pro Cys Arg Val Gly Val Ser Ser Phe Gly Ile
 435 440 445
 Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Ser Pro Val Glu Gln
 450 455 460
 Gly Glu Pro Ala Gly Pro Val Glu Gly Glu Arg Glu Pro Asp Val Ala
 465 470 475 480
 Val Pro Val Val Pro Trp Val Leu Ser Gly Lys Thr Pro Glu Ala Ala
 485 490 495

Arg Ala Gln Ala Glu Arg Val His Ser His Ile Glu Asp Arg Pro Gly
 500 505 510

Leu Ser Pro Val Asp Val Ala Tyr Ser Leu Gly Met Thr Arg Ala Ala
 515 520 525

Leu Asp Glu Arg Ala Val Val Leu Gly Ser Asp Arg Ala Ala Leu Leu
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Thr Gly Leu Arg Ala Phe Ala Asp Gly Cys Asp Ala Pro Glu Val Val
 545 550 555 560

Ser Gly Ser Val Gly Leu Gly Gly Arg Val Gly Phe Val Phe Ser Gly
 565 570 575

Gln Gly Gly Gln Trp Pro Gly Met Gly Arg Gly Leu Tyr Ser Val Phe
 580 585 590

Pro Val Phe Ala Asp Ala Phe Asp Glu Ala Cys Ala Glu Leu Asp Ala
 595 600 605

His Leu Gly Gln Glu Leu Arg Val Arg Asp Val Val Phe Gly Ser Gln
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Ala Trp Leu Leu Asp Arg Thr Val Trp Ala Gln Ser Gly Leu Phe Ala
 625 630 635 640

Leu Gln Ile Gly Leu Leu Arg Leu Leu Gly Ser Trp Gly Val Arg Pro
 645 650 655

Asp Val Val Leu Gly His Ser Val Gly Glu Leu Ala Ala Val His Ala
 660 665 670

Ala Gly Val Leu Ser Leu Ser Glu Ala Ala Arg Leu Val Ala Gly Arg
 675 680 685

Ala Arg Leu Met Gln Ala Leu Pro Ser Gly Gly Ala Met Leu Ala Val
 690 695 700

Ala Thr Gly Glu Phe Gln Val Asp Pro Leu Leu Asp Gly Val Arg Asp
 705 710 715 720

Arg Ile Gly Ile Ala Ala Val Asn Gly Pro Glu Ser Val Val Leu Ser
 725 730 735

Gly Asp Arg Glu Leu Leu Thr Glu Ile Ala Asp Arg Leu His Asp Gln
 740 745 750

Gly Cys Arg Thr Arg Trp Leu Arg Val Ser His Ala Phe His Ser Pro
 755 760 765

His Met Glu Pro Met Leu Glu Glu Phe Ala Gln Ile Ser Arg Gly Arg
 770 775 780

Glu Tyr His Ala Pro Glu Leu Pro Ile Ile Ser Thr Leu Ile Gly Glu
 785 790 795 800

Leu Asp Gly Gly Arg Val Met Gly Thr Pro Glu Tyr Trp Val Arg Gln
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Val Arg Glu Pro Val Arg Phe Ala Glu Gly Val Gln Ala Leu Val Gly
 820 825 830

Gln Gly Val Gly Thr Ile Val Glu Leu Gly Pro Asp Gly Ala Leu Ser
 835 840 845

Thr Leu Val Glu Glu Cys Val Ala Glu Ser Gly Arg Val Ala Gly Ile
 850 855 860

Pro Leu Met Arg Lys Asp Arg Asp Glu Ala Arg Thr Val Leu Ala Ala
 865 870 875 880

Leu Ala Gln Ile His Thr Arg Gly Gly Glu Val Asp Trp Arg Ser Phe
 885 890 895

Phe Ala Gly Thr Gly Ala Lys Gln Val Asp Leu Pro Thr Tyr Ala Phe
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Gln Arg Gln Arg Tyr Trp Leu Ala Ser Thr Gly Arg Ala Gly Asp Val
 915 920 925

Thr Ala Ala Gly Leu Ala Glu Ala Asp His Pro Leu Leu Gly Ala Val
 930 935 940

Val Ala Leu Ala Asp Gly Glu Gly Val Val Leu Thr Gly Arg Leu Thr
 945 950 955 960

Ala Gly Ser His Pro Trp Leu Ser Asp His Arg Val Leu Gly Glu Ile
 965 970 975

Val Val Pro Gly Thr Ala Ile Val Glu Leu Val Trp His Val Gly Glu
 980 985 990

Arg Leu Gly Cys Gly Arg Val Glu Glu Leu Ala Leu Glu Ala Pro Leu
 995 1000 1005

Ile Leu Pro Asp His Gly Ala Val Gln Val Gln Val Leu Val Gly Pro
 1010 1015 1020

Pro Gly Glu Ser Gly Ala Arg Ser Val Ala Leu Tyr Ser Cys Pro Gly
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Glu Ala Ile Glu Pro Glu Trp Lys Lys His Ala Thr Gly Val Leu Leu
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Pro Pro Val Ala Ala Glu Asn His Glu Leu Thr Ala Trp Pro Pro Glu
 1060 1065 1070

Asn Ala Thr Glu Ile Asp Ala Asp Gly Val Tyr Ala Phe Leu Glu Gly
 1075 1080 1085

His Gly Phe Ala Tyr Gly Pro Ala Phe Arg Cys Leu Arg Gly Ala Trp
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Arg Arg Gly Gly Glu Val Phe Ala Glu Val Ala Leu Pro Asp Asp Met
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Gln Ala Gly Val Asp Arg Phe Gly Val His Pro Ala Leu Leu Asp Ala
 1125 1130 1135

Val Leu His Ala Ala Ala Ala Glu Thr Ser Val Val Gln Ser Glu Ala
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Arg Val Pro Phe Ser Trp Arg Gly Val Glu Leu Arg Ala Thr Glu Ser
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Ala Val Val Arg Ala Arg Leu Ser Leu Thr Ser Asp Asp Glu Leu Ser
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Leu Val Ala Val Asp Pro Ala Gly Arg Phe Val Ala Thr Val Asp Ser
 185 1190 1195 1200

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Gly Asp Cys Leu Phe Glu Val Glu Trp His Arg Lys Ala Leu Leu Gly
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 1235 1240 1245

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 265 1270 1275 1280

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Ser Ser Trp Gly Leu Leu Ser Ser Ala Gln Ser Glu Asn Pro Gly Arg
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Phe Val Leu Val Asp Val Asp Gly Thr Pro Glu Ser Trp Gln Ala Leu
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Pro Ala Ala Val Arg Ala Gly Glu Pro Gln Leu Ala Leu Arg Arg Gly
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Val Ala Leu Val Pro Arg Leu Ala Arg Leu Thr Val Arg Glu Glu Gly
 1395 1400 1405

Ser Ser Pro Gln Leu Asp Thr Asp Gly Thr Val Leu Ile Thr Gly Gly
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Thr Gly Ala Leu Gly Gly Val Val Ala Arg His Leu Val Glu Glu His
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Gly Ile Arg Arg Leu Val Leu Ala Gly Arg Arg Gly Trp Asn Ala Pro
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Gly Val His Glu Leu Val Asp Glu Leu Ala Arg Ala Gly Ala Val Val
 1460 1465 1470

Glu Val Val Ala Cys Asp Val Ala Asp Arg Thr Asp Leu Glu His Val
 1475 1480 1485

Leu Ala Ala Ile Pro Val Asp Trp Pro Leu Arg Gly Ile Val His Thr
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Ala Gly Val Leu Ala Asp Gly Val Ile Gly Ser Leu Ser Ala Ala Asp
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Val Gly Thr Val Phe Ala Pro Lys Val Thr Gly Ala Trp His Leu His
 1525 1530 1535

Glu Leu Thr Arg Asp Leu Asp Leu Ser Phe Phe Val Leu Phe Ser Ser
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Phe Ser Gly Ile Ala Gly Ala Ala Gly Gln Ala Asn Tyr Ala Ala Ala
 1555 1560 1565

Asn Thr Phe Leu Asp Ala Leu Ala Arg Tyr Arg Arg Ala Arg Gly Leu
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Pro Gly Leu Ser Leu Ala Trp Gly Leu Trp Ala Gln Pro Ser Gly Met
 585 1590 1595 1600

Thr Ser Gly Leu Asp Ala Ala Ser Val Glu Arg Leu Ala Arg Thr Gly
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Ile Ala Glu Leu Ser Thr Glu Asp Gly Leu Arg Leu Phe Asp Ala Ala
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Phe Ala Lys Asp Arg Ala Cys Val Val Ala Ala Arg Leu Asp Arg Ala
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Leu Leu Val Gly Asn Gly Arg Ser His Ala Ile Pro Ala Leu Leu Ser
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Ala Leu Val Pro Val Arg Gly Gly Val Ala Arg Lys Thr Ala Asn Ser
 665 1670 1675 1680

Gln Ala Ala Asp Glu Asp Ala Leu Leu Gly Leu Val Arg Glu His Val
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Ser Ala Val Leu Gly Tyr Ser Gly Ala Val Glu Val Gly Gly Asp Arg
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Asn Arg Leu Ala Gly Val Leu Gly Val Arg Leu Pro Ala Thr Ala Val
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Leu Ala Gly Glu Val Ala Ser Thr Ser Thr Pro Val Thr Arg Ala Ala
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Ser Ala Glu Glu Asp Leu Val Ala Ile Val Gly Met Gly Cys Arg Phe
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Pro Gly Gly Val Ser Ser Pro Glu Glu Leu Trp Arg Leu Val Ala Gly
 1795 1800 1805

Gly Val Asp Ala Val Ala Gly Phe Pro Asp Asp Arg Gly Trp Asp Leu
 1810 1815 1820

Ala Ala Leu Tyr Asp Pro Asp Pro Asp Arg Leu Gly Thr Ser Tyr Val
 825 1830 1835 1840

Cys Glu Gly Gly Phe Leu Arg Asp Ala Ala Glu Phe Asp Ala Asp Met
 1845 1850 1855

Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg
 1860 1865 1870

Leu Leu Leu Glu Val Ala Trp Glu Thr Leu Glu Arg Ala Gly Ile Asp
 1875 1880 1885

Pro Phe Ser Leu His Gly Ser Arg Thr Gly Val Phe Ala Gly Leu Met
 1890 1895 1900

Tyr His Asp Tyr Gly Ala Arg Phe Ile Thr Arg Ala Pro Glu Gly Phe
 905 1910 1915 1920

Glu Gly His Leu Gly Thr Gly Asn Ala Gly Ser Val Leu Ser Gly Arg
 1925 1930 1935

Val Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr
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Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ala Leu
 1955 1960 1965

Arg Ala Gly Glu Cys Glu Phe Ala Leu Ala Gly Gly Val Thr Val Met
 1970 1975 1980

Ser Thr Pro Thr Thr Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala
 985 1990 1995 2000

Pro Asp Gly Arg Cys Lys Ser Phe Ala Ala Ala Ala Asp Gly Thr Gly
 2005 2010 2015

Trp Gly Glu Gly Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp Ala
 2020 2025 2030

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Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr Gly Arg Asp Arg
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Asp Pro Gly Arg Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile Gly
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His Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile Lys Met Val Met
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Pro Arg Glu Ser Gln Arg Ser Thr Glu Pro Asp Ser Gly Ser Val Arg
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Asp Phe Pro Val Val Pro Trp Met Val Ser Gly Lys Thr Pro Glu Ala
 2225 2230 2235 2240

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Asp Ala Ser Pro Arg Asp Ile Gly Tyr Ser Leu Ala Val Thr Arg Pro
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Leu Pro Gly Leu Lys Ala Leu Ala Val Ser Asn Asp Ala Ala Glu Val
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Ala Arg Leu Met Gln Ala Leu Pro Thr Gly Gly Ala Met Leu Ala Ala
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Gly Ile Arg Ser Arg Trp Leu Arg Val Ser His Ala Phe His Ser His
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Asp Tyr Arg Ser Ser Gly Leu Pro Ile Val Ser Thr Leu Thr Gly Glu
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Leu Asp Glu Val Gly Met Pro Ala Thr Pro Glu Tyr Trp Val Arg Gln
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Val Arg Glu Pro Val Arg Phe Ala Asp Gly Val Ala Ala Leu Ala Ala
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Thr Thr Ala Leu Ala Gln Ile His Val Arg Gly Ala Glu Val Asp Trp
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Arg Ser Phe Phe Ala Gly Thr Gly Ala Lys Gln Val Glu Leu Pro Thr
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Tyr Ala Phe Gln Arg Gln Arg Tyr Trp Leu Asp Ser Pro Ser Glu Pro
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Val Gly Gln Ser Ala Asp Pro Ala Arg Gln Ser Gly Phe Trp Glu Leu
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Val Glu Gln Glu Asp Val Ser Ala Leu Ser Ala Ala Leu His Ile Thr
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Gly Asp His Asp Val Gln Ala Ser Leu Glu Ser Val Val Pro Val Leu
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Ser Ser Trp His Arg Arg Ile Arg Asn Glu Ser Leu Val His Gln Trp
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Arg Tyr Arg Ile Ser Trp His Glu Arg Ala Asp Leu Pro Asp Pro Ser
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Leu Ser Gly Thr Trp Leu Val Val Val Pro Glu Gly Trp Ser Ala Ser
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Ala Val Leu Phe Glu Leu Ala Gly His Asp Glu Glu Ala Leu Ala Gln
 785 2790 2795 2800

Arg Phe Arg Ser Leu Pro Val Ala Ser Gly Gly Ile Ser Gly Val Leu
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Ser Leu Leu Ala Leu Asp Glu Ser Pro Ser Ser Pro Asn Ala Ala Leu
 2820 2825 2830

Pro Asn Gly Ala Leu Asn Ser Leu Val Leu Leu Arg Ala Leu Arg Ala
 2835 2840 2845

Ala Asp Val Ser Ala Pro Leu Trp Leu Ala Thr Cys Gly Gly Val Ala
 2850 2855 2860

Val Gly Asp Val Pro Val Asn Pro Gly Gln Ala Leu Val Trp Gly Leu
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Gly Arg Val Val Gly Leu Glu His Pro Ala Trp Trp Gly Gly Leu Val
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Val Phe Val Arg Arg Leu Glu Arg Ala Gly Ala Ala Ser Gly Ala Gly
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His Val Val Leu Thr Ser Arg Arg Gly Ala Ala Ala Pro Gly Ala Gly
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Ala Cys Asp Val Ala Asp Arg Asp Ala Leu Ala Glu Val Leu Ala Thr
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Val Glu Val Gly Asp Val Ala Ser Met Cys Leu Thr Asp Phe Val Gly
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Ala Asp Val Glu Leu Asp Ala Phe Val Leu Phe Ser Ser Val Ser Gly
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Val Trp Gly Ala Gly Gly Gln Gly Ala Tyr Ala Ala Ala Asn Ala Tyr
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Leu Val Val Ala Asp Met Ala Trp Glu Arg Phe Ala Pro Val Phe Ala
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Met Ser Arg Arg Arg Pro Leu Leu Asp Glu Leu Pro Glu Ala Gln Gln
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Ala Leu Ala Asp Ala Glu Asn Thr Thr Asp Ala Ala Asp Ser Ala Val
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Pro Leu Pro Arg Leu Ala Gly Met Ala Ala Ala Glu Arg Arg Arg Ala
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Asp Ser Leu Met Ala Val Glu Leu Arg Asn Arg Leu Gly Glu Ala Thr
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Val Ala Met Gly Cys Arg Tyr Pro Gly Asp Val Cys Ser Pro Glu Glu
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Val Asp Arg Gly Trp Asp Cys Asn Thr Leu Phe Asp Pro Asp Pro Asp
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Arg Ala Gly Ser Thr Tyr Val Arg Glu Gly Ala Phe Leu Thr Gly Ala
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Asp Arg Phe Asp Ala Gly Phe Phe Gly Ile Ser Pro Arg Glu Ala Arg
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Ala Met Asp Pro Gln Gln Arg Leu Leu Leu Glu Val Ala Trp Glu Val
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Phe Glu Arg Ala Gly Ile Ala Pro Leu Ser Leu Arg Gly Ser Arg Thr
 425 3430 3435 3440

Gly Val Phe Ala Gly Thr Asn Gly Gln Asp His Gly Ala Lys Val Ala
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Ala Ala Pro Glu Ala Ala Gly His Leu Leu Thr Gly Asn Ala Ala Ser
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Val Leu Ala Gly Arg Leu Ser Tyr Thr Phe Gly Leu Glu Gly Pro Ala
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Val Ala Val Asp Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu
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Ala Cys Gln Ser Leu Arg Ser Gly Glu Cys Asp Met Ala Leu Ala Gly
 505 3510 3515 3520

Gly Val Thr Val Met Ser Thr Pro Leu Ala Phe Leu Glu Phe Ser Arg
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Gln Arg Gly Leu Ala Pro Asp Gly Arg Cys Lys Ser Phe Ala Ala Ala
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Pro Asn Gly Pro Ser Gln Gln Arg Val Ile Arg Gln Ala Leu Ala Asn
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Ala Gly Leu Ser Ala Ser Asp Val Asp Val Val Glu Ala His Gly Thr
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Gly Thr Gly Leu Gly Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr
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Tyr Gly Gln Glu Arg Asp Pro Glu Arg Ala Leu Trp Leu Gly Ser Ile
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Lys Ser Asn Ile Gly His Thr Gln Ala Ala Ala Gly Val Ala Gly Val
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Ile Lys Met Val Gln Ala Met Arg His Gly Glu Leu Pro Ala Thr Leu
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His Val Asp Lys Pro Thr Pro Gln Val Asp Trp Ser Ala Gly Ala Val
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Arg Leu Leu Thr Gly Asn Thr Pro Trp Pro Glu Ser Gly Arg Pro Arg
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Arg Ala Gly Val Ser Ser Phe Gly Ile Ser Gly Thr Asn Ala His Leu
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Ile Leu Glu Gln Pro Pro Ser Glu Pro Ala Glu Ile Asp Gln Ser Asp
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Arg Arg Val Thr Ala His Pro Ala Val Ile Pro Trp Met Leu Ser Ala
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Arg Ser Leu Ala Ala Leu Gln Ala Gln Ala Ala Ala Leu Gln Ala Arg
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Leu Asp Arg Gly Pro Gly Ala Ser Pro Leu Asp Leu Gly Tyr Ser Leu
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Ala Thr Thr Arg Ser Val Leu Asp Glu Arg Ala Val Val Trp Gly Ala
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Asp Arg Glu Ala Leu Leu Ser Arg Leu Ala Ala Leu Ala Asp Gly Arg
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Thr Ala Pro Gly Val Ile Thr Gly Ser Ala Asn Ser Gly Gly Arg Ile
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Gly Phe Val Phe Ser Gly Gln Gly Ser Gln Trp Leu Gly Met Gly Lys
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Cys Asp Ala Leu Ser Ala His Leu Gly Ala Asp Val Arg Gly Val Leu
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Phe Gly Ala Asp Glu Gln Met Leu Asp Arg Thr Leu Trp Ala Gln Ser
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Gly Val Arg Pro Ala Ala Val Leu Gly His Ser Val Gly Glu Leu Ala
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Ala Ala His Ala Ala Gly Val Leu Ser Leu Pro Asp Ala Ala Arg Leu
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Val Ala Ala Arg Ala His Leu Met Gln Ala Leu Pro Thr Gly Gly Ala
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Met Leu Ala Val Ala Thr Ser Glu Ala Ala Val Gly Pro Leu Leu Ser
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Gly Val Cys Asp Arg Val Ser Ile Ala Ala Ile Asn Gly Pro Glu Ser
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Val Val Leu Ser Gly Asp Arg Asp Val Leu Val Glu Leu Ala Gly Glu
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Phe Asp Ala Arg Gly Leu Arg Thr Lys Trp Leu Arg Val Ser His Ala
4035 4040 4045

Phe His Ser His Arg Met Glu Pro Ile Leu Asp Glu Tyr Ala Glu Thr
4050 4055 4060

Ala Arg Cys Val Glu Phe Gly Glu Pro Val Val Pro Ile Val Ser Ala
065 4070 4075 4080

Ala Thr Gly Ala Leu Asp Thr Thr Gly Leu Met Cys Ala Ala Asp Tyr
 4085 4090 4095

Trp Thr Arg Gln Val Arg Asp Pro Val Arg Phe Gly Asp Gly Val Arg
 4100 4105 4110

Ala Leu Val Gly Gln Gly Val Asp Thr Ile Val Glu Phe Gly Pro Asp
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Gly Ala Leu Ser Ala Leu Val Glu Gln Cys Leu Ala Gly Ser Asp Gln
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Ala Gly Arg Val Ala Ala Ile Pro Leu Met Arg Arg Asp Arg Asp Glu
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Val Glu Thr Ala Val Ala Ala Leu Ala His Val His Val Arg Gly Gly
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Ala Val Asp Trp Ser Ala Cys Phe Ala Gly Thr Gly Ala Arg Thr Val
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Glu Leu Pro Thr Tyr Ala Phe Gln Arg Gln Arg Tyr Trp Leu Ala Gly
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Gln Ala Asp Gly Arg Gly Gly Asp Val Val Ala Asp Pro Val Asp Ala
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Arg Phe Trp Glu Leu Val Glu Arg Ala Asp Pro Glu Pro Leu Val Asp
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Glu Leu Cys Ile Asp Arg Asp Gln Pro Phe Arg Glu Val Leu Pro Val
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Trp Arg Tyr Gln Val Arg Trp Arg Ser Val Glu Val Pro Ser Ala Ala
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Asp Gln Pro Ala Val Val Ile Asp Ala Leu Ile Ala Arg Gly Ala Glu
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Val Ala Val Leu Glu Leu Thr Glu Gln Asp Leu Gln Arg Ser Ala Leu
 4325 4330 4335

Val Asp Lys Val Arg Ala Val Ile Ala Asp Arg Thr Glu Val Thr Gly
 4340 4345 4350

Val Leu Ser Leu Leu Ala Met Asp Gly Met Pro Cys Ala Ala His Pro
 4355 4360 4365

His Leu Ser Arg Gly Val Ala Ala Thr Val Ile Leu Thr Gln Val Leu
 4370 4375 4380

Gly Asp Ala Gly Val Ser Ala Pro Leu Trp Leu Ala Thr Thr Gly Gly
 385 4390 4395 4400

Val Glu Ala Gly Thr Glu Asp Gly Pro Ala Asp Pro Asp His Gly Leu
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Ile Trp Gly Leu Gly Arg Val Val Gly Leu Glu His Pro Gln Trp Trp
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 His Asp Pro Ile Ala Ile Val Ser Met Gly Cys Arg Tyr Pro Gly Gly
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Pro Thr Tyr Pro Phe Gln Arg Gln Arg Tyr Trp Leu Glu Ser Ala Glu	
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Tyr Asp Ala Gly Asp Leu Gly Ser Val Gly Leu Leu Ser Ala Glu His	
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Lys Gln Leu Ala Ala Ala Arg Ala Met Glu His Glu Ser Leu Phe Arg	
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His Leu His Glu Leu Thr Leu Asp Leu Asp Leu Ser Phe Phe Val Leu	
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 1845 1850 1855

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 1940 1945 1950

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 Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ala
 1955 1960 1965

ctg cgg tct ggt gag tgt gat ctg gct ctt gcg ggt ggt gtg acg gtg 5952
 Leu Arg Ser Gly Glu Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val
 1970 1975 1980

atg gcc acg ccg ggg atg ttc gtg gag ttt tcg cgt caa cgg ggc ttg 6000
 Met Ala Thr Pro Gly Met Phe Val Glu Phe Ser Arg Gln Arg Gly Leu
 1985 1990 1995 2000

gcg gcg gat ggg cgg tgc aag tcg ttt gcg gcg gct gcg gat ggc acc	6048
Ala Ala Asp Gly Arg Cys Lys Ser Phe Ala Ala Ala Ala Asp Gly Thr	
2005 2010 2015	
ggt tgg gga gaa ggc gcg ggc ttg gtg ttg ttg gag cgg ctg tcg gat	6096
Gly Trp Gly Glu Gly Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp	
2020 2025 2030	
gcc cgg cgc aac ggg cac gcg gtt ctg gcg gtc gtg cgg ggt agc gcg	6144
Ala Arg Arg Asn Gly His Ala Val Leu Ala Val Val Arg Gly Ser Ala	
2035 2040 2045	
gtg aat cag gat ggt gcg tcg aat ggt ttg acg gcg ccg aat ggg ccc	6192
Val Asn Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro	
2050 2055 2060	
tcg cag cag cgg gtg atc acg cag gcg ttg gcg agt gct ggt ttg tcg	6240
Ser Gln Gln Arg Val Ile Thr Gln Ala Leu Ala Ser Ala Gly Leu Ser	
2065 2070 2075 2080	
gtg tct gat gtg gac gcc gtg gag gcg cat ggg act gga acc agg ctt	6288
Val Ser Asp Val Asp Ala Val Glu Ala His Gly Thr Gly Thr Arg Leu	
2085 2090 2095	
ggt gat ccg att gag gcg cag gct ctg att gcc act tac ggg cag ggg	6336
Gly Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr Gly Gln Gly	
2100 2105 2110	
cgg gat agc gat cgg ccg ttg tgg ttg ggg tcg gtg aag tcg aat att	6384
Arg Asp Ser Asp Arg Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile	
2115 2120 2125	
ggt cat acg cag gcg gcg gcg ggt gtc gct ggt gtg atc aag atg gtg	6432
Gly His Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile Lys Met Val	
2130 2135 2140	
atg gcg atg cgg cac ggg cag ctg ccc gcg acg ttg cat gtg gat gaa	6480
Met Ala Met Arg His Gly Gln Leu Pro Ala Thr Leu His Val Asp Glu	
2145 2150 2155 2160	
cct acg tcg gaa gtg gat tgg tcg gcg ggg gat gtc cag ctc ctc acg	6528
Pro Thr Ser Glu Val Asp Trp Ser Ala Gly Asp Val Gln Leu Leu Thr	
2165 2170 2175	
gag aac acc ccc tgg ccc ggc aac agc cat cct cgg cgg gtg ggc gtg	6576
Glu Asn Thr Pro Trp Pro Gly Asn Ser His Pro Arg Arg Val Gly Val	
2180 2185 2190	

tcg tcg ttc ggg atc agc ggc acc aac gca cac gtc atc ctc gaa caa	6624
Ser Ser Phe Gly Ile Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln	
2195 2200 2205	
gcc tcg aaa aca cca gac gag act gcg gac aag agc ggt ccc gat tcg	6672
Ala Ser Lys Thr Pro Asp Glu Thr Ala Asp Lys Ser Gly Pro Asp Ser	
2210 2215 2220	
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Glu Ser Thr Val Asp Leu Pro Ala Val Pro Leu Ile Val Ser Gly Arg	
2225 2230 2235 2240	
aca ccg gca gcg ctc agc gct cag gcg agc gca ttg ttg tcc tat ttg	6768
Thr Pro Ala Ala Leu Ser Ala Gln Ala Ser Ala Leu Leu Ser Tyr Leu	
2245 2250 2255	
ggg gag cgt ggc gat att tcc acg ctg gat gcg gcg ttt tcg ttg gct	6816
Gly Glu Arg Gly Asp Ile Ser Thr Leu Asp Ala Ala Phe Ser Leu Ala	
2260 2265 2270	
tcc tcc cgg gcc gcg ttg gag gag cgg gcg gtg gtg ctg gga gcg gac	6864
Ser Ser Arg Ala Ala Leu Glu Glu Arg Ala Val Val Leu Gly Ala Asp	
2275 2280 2285	
cgc gaa acg ttg ttg tcc ggg ttg gaa gcg ctg gct tcc ggt cgc gag	6912
Arg Glu Thr Leu Leu Ser Gly Leu Glu Ala Leu Ala Ser Gly Arg Glu	
2290 2295 2300	
gct tct ggg gtg gtg tcg gga tcc ccg gtc tct ggc ggg gtt ggg ttc	6960
Ala Ser Gly Val Val Ser Gly Ser Pro Val Ser Gly Gly Val Gly Phe	
2305 2310 2315 2320	
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Val Phe Ala Gly Gln Gly Gly Gln Trp Leu Gly Met Gly Arg Gly Leu	
2325 2330 2335	
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Tyr Ser Val Phe Pro Val Phe Ala Asp Ala Phe Asp Glu Ala Cys Ala	
2340 2345 2350	
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Gly Leu Asp Ala His Leu Gly Gln Asp Val Gly Val Arg Asp Val Val	
2355 2360 2365	
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Phe Gly Ser Asp Gly Ser Leu Leu Asp Arg Thr Leu Trp Ala Gln Ser	
2370 2375 2380	

ggt ttg ttc gcg ttg cag gtt ggt ttg ctg agc ctg ctg ggt tgc tgg	7200
Gly Leu Phe Ala Leu Gln Val Gly Leu Leu Ser Leu Leu Gly Ser Trp	
2385 2390 2395 2400	
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Gly Val Arg Pro Gly Val Val Leu Gly His Ser Val Gly Glu Phe Ala	
2405 2410 2415	
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Ala Ala Val Ala Ala Gly Val Leu Ser Leu Pro Asp Ala Ala Arg Met	
2420 2425 2430	
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Val Ala Gly Arg Ala Arg Leu Met Gln Ala Leu Pro Ser Gly Gly Ala	
2435 2440 2445	
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Met Leu Ala Val Ala Ala Gly Glu Glu Gln Leu Arg Pro Leu Leu Ala	
2450 2455 2460	
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Asp Arg Val Asp Gly Ala Gly Ile Ala Ala Val Asn Ala Pro Glu Ser	
2465 2470 2475 2480	
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Val Val Leu Ser Gly Asp Arg Glu Val Leu Asp Asp Ile Ala Gly Ala	
2485 2490 2495	
ctg gat ggg caa ggg att cgg tgg cgg cgg ttg cgg gtt tgc cat gcg	7536
Leu Asp Gly Gln Gly Ile Arg Trp Arg Arg Leu Arg Val Ser His Ala	
2500 2505 2510	
ttt cat tgc tat cgg atg gac ccg atg ttg cag gag ttc gcc gaa atc	7584
Phe His Ser Tyr Arg Met Asp Pro Met Leu Gln Glu Phe Ala Glu Ile	
2515 2520 2525	
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Ala Arg Ser Val Asp Tyr Arg Arg Gly Asp Leu Pro Val Val Ser Thr	
2530 2535 2540	
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Leu Thr Gly Glu Leu Asp Thr Ala Gly Val Met Ala Thr Pro Glu Tyr	
2545 2550 2555 2560	
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Trp Val Arg Gln Val Arg Glu Pro Val Arg Phe Ala Asp Gly Val Arg	
2565 2570 2575	

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Val Leu Ala Gln Gln Gly Val Ala Thr Ile Phe Glu Leu Gly Pro Asp	
2580 2585 2590	
gcg acg ctg tcg gcc ctg att ccc gat tgt cat tcg tgg gct gat cag	7824
Ala Thr Leu Ser Ala Leu Ile Pro Asp Cys His Ser Trp Ala Asp Gln	
2595 2600 2605	
gcc atg ccg att ccg atg ctg cgt aaa gac cgt acg gaa acc gaa act	7872
Ala Met Pro Ile Pro Met Leu Arg Lys Asp Arg Thr Glu Thr Glu Thr	
2610 2615 2620	
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Val Val Ala Ala Val Ala Arg Ala His Thr Arg Gly Val Pro Val Glu	
2625 2630 2635 2640	
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Trp Ser Ala Tyr Phe Ala Gly Thr Gly Ala Arg Arg Val Glu Leu Pro	
2645 2650 2655	
acg tat gcc ttc cag cgg cag cgg tac tgg ctg gaa aca tcg gat tac	8016
Thr Tyr Ala Phe Gln Arg Gln Arg Tyr Trp Leu Glu Thr Ser Asp Tyr	
2660 2665 2670	
ggc gat gtg acg ggt atc ggc ctg gct gcg gcg gag cat ccg ttg ctg	8064
Gly Asp Val Thr Gly Ile Gly Leu Ala Ala Ala Glu His Pro Leu Leu	
2675 2680 2685	
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Gly Ala Val Val Ala Leu Ala Asp Gly Asp Gly Met Val Leu Thr Gly	
2690 2695 2700	
cgg ttg tcg gtg ggg acg cat ccg tgg ctg gcc cag cat cgc gtg ctg	8160
Arg Leu Ser Val Gly Thr His Pro Trp Leu Ala Gln His Arg Val Leu	
2705 2710 2715 2720	
ggc gag gtc gtc gtc ccc ggc acc gcc atc ctg gag atg gcc ctg cac	8208
Gly Glu Val Val Val Pro Gly Thr Ala Ile Leu Glu Met Ala Leu His	
2725 2730 2735	
gca ggg gcg cgt ctc ggc tgt gac cgg gtg gaa gag ctc acc ctg gaa	8256
Ala Gly Ala Arg Leu Gly Cys Asp Arg Val Glu Glu Leu Thr Leu Glu	
2740 2745 2750	
aca ccg ctg gtg gtc ccc gaa cgc gcg gcg ggt gcc ggt agt cgt ggc	8304
Thr Pro Leu Val Val Pro Glu Arg Ala Ala Gly Ala Gly Ser Arg Gly	
2755 2760 2765	

cct gcg gga ggg acc aca gtt tca att gaa act gcg gaa gaa cgt gtg	8352
Pro Ala Gly Gly Thr Thr Val Ser Ile Glu Thr Ala Glu Glu Arg Val	
2770 2775 2780	
cgg acg aac gac gcc atc gaa atc cag ctg ctg gtg aac gca ccc gac	8400
Arg Thr Asn Asp Ala Ile Glu Ile Gln Leu Leu Val Asn Ala Pro Asp	
2785 2790 2795 2800	
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Glu Gly Gly Arg Arg Arg Val Ser Leu Tyr Ser Arg Pro Ala Gly Gly	
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Ser Arg Gly Gly Gly Trp Thr Arg His Ala Thr Gly Glu Leu Val Val	
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Gly Thr Thr Gly Gly Arg Ala Val Pro Asp Trp Ser Ala Glu Gly Ala	
2835 2840 2845	
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Glu Ser Ile Ala Leu Asp Glu Phe Tyr Val Ala Leu Ala Gly Asn Gly	
2850 2855 2860	
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Phe Glu Tyr Gly Pro Leu Phe Gln Gly Leu Gln Ala Ala Trp Arg Arg	
2865 2870 2875 2880	
ggt gac gag gtt ctc gcc gaa atc gcc ccg ccg gcc gag gcc gat gcg	8688
Gly Asp Glu Val Leu Ala Glu Ile Ala Pro Pro Ala Glu Ala Asp Ala	
2885 2890 2895	
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Met Ala Ser Gly Tyr Leu Leu Asp Pro Ala Leu Leu Asp Ala Ala Leu	
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Gln Ala Ser Ala Leu Gly Asp Arg Pro Glu Gln Gly Gly Ala Trp Leu	
2915 2920 2925	
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Pro Phe Ser Phe Thr Gly Val Glu Leu Ser Ala Pro Ala Gly Thr Ile	
2930 2935 2940	
agc agg gtg cgg ctg gag acc agg cga ccc gac gcg ata tcg gtg gcc	8880
Ser Arg Val Arg Leu Glu Thr Arg Arg Pro Asp Ala Ile Ser Val Ala	
2945 2950 2955 2960	

gtg atg gat gag agt ggg cgg ttg ctc gcc tcg atc gat tct ctc agg	8928
Val Met Asp Glu Ser Gly Arg Leu Leu Ala Ser Ile Asp Ser Leu Arg	
2965 2970 2975	
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Leu Arg Ser Val Ser Ser Gly Gln Leu Ala Asn Arg Asp Ala Val Arg	
2980 2985 2990	
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Asp Ala Leu Phe Glu Val Thr Trp Glu Pro Val Ala Thr Gln Ser Thr	
2995 3000 3005	
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Glu Pro Gly Arg Trp Ala Leu Leu Gly Asp Thr Ala Cys Gly Lys Asp	
3010 3015 3020	
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Asp Leu Ile Lys Leu Ala Thr Asp Ser Ala Asp Arg Cys Ala Asp Leu	
3025 3030 3035 3040	
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Ala Ala Leu Ala Glu Lys Leu Asp Ser Ser Ala Leu Val Pro Asp Val	
3045 3050 3055	
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Val Val Tyr Cys Ala Gly Glu Gln Ala Asp Pro Gly Thr Gly Ala Ala	
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Ala Leu Ala Glu Thr Gln Gln Thr Leu Ala Leu Leu Gln Ala Trp Leu	
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gct gag ccg cgg ttg gcc gag gca cgt ctg gtg gtg gtg acg tgt gca	9312
Ala Glu Pro Arg Leu Ala Glu Ala Arg Leu Val Val Val Thr Cys Ala	
3090 3095 3100	
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Ala Val Thr Thr Ala Pro Ser Asp Gly Ala Ser Glu Leu Ala His Ala	
3105 3110 3115 3120	
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Pro Leu Trp Gly Leu Leu Arg Ala Ala Gln Val Glu Asn Pro Gly Gln	
3125 3130 3135	
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Phe Val Leu Ala Asp Val Asp Gly Thr Ala Glu Ser Trp Arg Ala Leu	
3140 3145 3150	

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Pro Ser Ala Leu Gly Ser Met Glu Pro Gln Leu Ala Leu Arg Lys Gly	
3155 3160 3165	
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Ala Val Arg Ala Pro Arg Leu Ala Ser Val Ala Gly Gln Ile Asp Val	
3170 3175 3180	
ccc gcg gtt gtg gcg gat ccc gac cga acc gtg ctg att tcg ggc ggc	9600
Pro Ala Val Val Ala Asp Pro Asp Arg Thr Val Leu Ile Ser Gly Gly	
3185 3190 3195 3200	
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Thr Gly Leu Leu Gly Gly Ala Val Ala Arg His Leu Val Thr Glu Arg	
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Gly Val Arg Arg Leu Val Leu Thr Gly Arg Arg Gly Trp Asp Ala Pro	
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Asp Val Val Ala Cys Asp Val Ala Asp Arg Ala Asp Leu Glu Ser Leu	
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Ala Gly Ala Leu Ala Asp Gly Val Ile Glu Ser Leu Ser Pro Asp Asp	
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Val Gly Ala Val Phe Gly Pro Lys Ala Ala Gly Ala Trp Asn Leu His	
3300 3305 3310	
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Glu Leu Thr Arg Asp Thr Asp Leu Ser Phe Phe Ala Leu Phe Ser Ser	
3315 3320 3325	
ctt tcc ggt gtt gcc ggc gct cct ggt cag ggc aat tat gcg gcg gcg	10032
Leu Ser Gly Val Ala Gly Ala Pro Gly Gln Gly Asn Tyr Ala Ala Ala	
3330 3335 3340	

289

gac gag atc gct acg acg cca gcg ccg gtg acg acg acc agg gca ccg	10656
Asp Glu Ile Ala Thr Thr Pro Ala Pro Val Thr Thr Thr Arg Ala Pro	
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Val Ala Glu Asp Asp Leu Val Ala Ile Val Gly Met Gly Cys Arg Phe	
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Pro Gly Gln Val Ser Ser Pro Glu Glu Leu Trp Arg Leu Val Ala Gly	
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Gly Val Asp Ala Val Ala Asp Phe Pro Ala Asp Arg Gly Trp Asp Leu	
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Ala Gly Leu Phe Asp Pro Asp Pro Glu Arg Ala Gly Lys Thr Tyr Val	
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Arg Glu Gly Ala Phe Leu Thr Asp Ala Asp Arg Phe Asp Ala Gly Phe	
3620 3625 3630	
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Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met Asp Pro Gln Gln Arg	
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Leu Leu Leu Glu Leu Ser Trp Glu Ala Ile Glu Arg Ala Gly Ile Asp	
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Pro Gly Ser Leu Arg Gly Ser Arg Thr Gly Val Phe Ala Gly Leu Met	
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Tyr His Asp Tyr Gly Ala Arg Phe Ala Ser Arg Ala Pro Glu Gly Phe	
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Glu Gly Tyr Leu Gly Asn Gly Ser Ala Gly Ser Val Ala Ser Gly Arg	
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Ile Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp Thr	
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Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ser Leu	
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Arg Ser Gly Glu Cys Asp Leu Ala Leu Ala Gly Gly Val Thr Val Met	
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Ser Thr Pro Gly Thr Phe Val Glu Phe Ser Arg Gln Arg Gly Leu Ala	
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Pro Asp Gly Arg Cys Lys Ser Phe Ala Glu Ser Ala Asp Gly Thr Gly	
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Trp Gly Glu Gly Ala Gly Leu Val Leu Leu Glu Arg Leu Ser Asp Ala	
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Arg Arg Asn Gly His Arg Val Leu Ala Val Val Arg Gly Ser Ala Val	
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Asn Gln Asp Gly Ala Ser Asn Gly Leu Thr Ala Pro Asn Gly Pro Ser	
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Gln Gln Arg Val Ile Gln Gln Ala Leu Ala Ser Ala Gly Leu Ser Val	
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Ser Asp Val Asp Ala Val Glu Ala His Gly Thr Gly Thr Arg Leu Gly	
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Asp Pro Ile Glu Ala Gln Ala Leu Ile Ala Thr Tyr Gly Arg Asp Arg	
3875 3880 3885	
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Asp Pro Gly Arg Pro Leu Trp Leu Gly Ser Val Lys Ser Asn Ile Gly	
3890 3895 3900	
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His Thr Gln Ala Ala Ala Gly Val Ala Gly Val Ile Lys Met Val Met	
3905 3910 3915 3920	

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Ala Met Arg His Gly Gln Leu Pro Arg Thr Leu His Val Asp Ala Pro	
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Ser Ser Gln Val Asp Trp Ser Ala Gly Arg Val Gln Leu Leu Thr Glu	
3940 3945 3950	
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Asn Thr Pro Trp Pro Asp Ser Gly Arg Pro Cys Arg Val Gly Val Ser	
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Ser Phe Gly Ile Ser Gly Thr Asn Ala His Val Ile Leu Glu Gln Ser	
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Thr Gly Gln Met Asp Gln Ala Ala Glu Pro Asp Ser Ser Pro Val Leu	
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Asp Val Pro Val Val Pro Trp Val Val Ser Gly Lys Thr Pro Glu Ala	
4005 4010 4015	
cta tcc gcc cag gcg gca acg ttg gcg acc tat ttg gac caa aat gtt	12096
Leu Ser Ala Gln Ala Ala Thr Leu Ala Thr Tyr Leu Asp Gln Asn Val	
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Asp Val Ser Pro Leu Asp Val Gly Ile Ser Leu Ala Val Thr Arg Ser	
4035 4040 4045	
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Ala Leu Asp Glu Arg Ala Val Val Leu Gly Ser Asp Arg Asp Thr Leu	
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Leu Ser Gly Leu Asn Ala Leu Ala Ala Gly His Glu Ala Ala Gly Val	
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Val Thr Gly Pro Val Gly Ile Gly Gly Arg Thr Gly Phe Val Phe Ala	
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Val Ser Ala Thr Glu Ala Arg Val Gly Pro Leu Leu Asp Gly Val Arg	
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Ser Gly Asp Arg Asp Val Leu Asp Gly Ile Ala Gly Arg Leu Asp Gly	
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Gln Gly Ile Arg Ser Arg Trp Leu Arg Val Ser His Ala Phe His Ser	
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His Arg Met Asp Pro Met Leu Ala Glu Phe Ala Glu Leu Ala Arg Ser	
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294

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Ser Cys Ala Val Val Gly Leu Gly Glu Pro Glu Trp His Ala Ala Leu	
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Lys Thr Thr Gly Val Gln Val Glu Ser His Ala Asp Leu Ala Ser Leu	
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<212> PRT

<213> Saccharopolyspora spinosa

<400> 50

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 Val Ser Thr Pro Glu Glu Leu Trp Arg Leu Val Val Asp Gly Gly Asp
 50 55 60
 Ala Ile Ala Asn Phe Pro Glu Asp Arg Gly Trp Asn Leu Asp Glu Leu
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 Phe Asp Pro Asp Pro Gly Arg Ala Gly Thr Ser Tyr Val Arg Glu Gly
 85 90 95
 Gly Phe Leu Arg Gly Val Ala Asp Phe Asp Ala Gly Leu Phe Gly Ile
 100 105 110
 Ser Pro Arg Glu Ala Gln Ala Met Asp Pro Gln Gln Arg Leu Leu Leu
 115 120 125
 Glu Ile Ser Trp Glu Val Phe Glu Arg Ala Gly Ile Asp Pro Phe Ser
 130 135 140
 Leu Arg Gly Thr Lys Thr Gly Val Phe Ala Gly Leu Ile Tyr His Asp
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 Tyr Ala Ser Arg Phe Arg Lys Thr Pro Ala Glu Phe Glu Gly Tyr Phe
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 Phe Gly Leu Glu Gly Pro Ala Val Thr Val Asp Thr Ala Cys Ser Ser
 195 200 205
 Ser Leu Val Ala Leu His Leu Ala Cys Gln Ser Leu Arg Leu Gly Glu
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 Cys Asp Leu Ala Leu Ala Gly Gly Ile Ser Val Met Ala Thr Pro Gly
 225 230 235 240
 Ala Phe Val Glu Phe Ser Arg Gln Arg Ala Leu Ala Ser Asp Gly Arg
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 Cys Lys Pro Phe Ala Asp Ala Ala Asp Gly Thr Gly Trp Gly Glu Gly
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 Ala Gly Met Leu Leu Leu Glu Arg Leu Ser Asp Ala Arg Arg Asn Gly
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His Pro Val Leu Ala Ala Val Val Gly Ser Ala Ile Asn Gln Asp Gly
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Thr Ser Asn Gly Leu Thr Ala Pro Ser Gly Pro Ala Gln Gln Arg Val
 305 310 315 320

Ile Arg Gln Ala Leu Ala Asn Ala Gly Leu Ser Pro Ala Glu Val Asp
 325 330 335

Val Val Glu Ala His Gly Thr Gly Thr Ala Leu Gly Asp Pro Ile Glu
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Ala Gln Ala Leu Ile Ala Thr Tyr Gly Ala Asn Arg Ser Ala Asp His
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Pro Leu Leu Leu Gly Ser Leu Lys Ser Asn Ile Gly His Thr Gln Ala
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Ala Ala Gly Val Ala Gly Val Ile Lys Ser Val Leu Ala Ile Arg His
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Asp Trp Ser Ala Gly Ala Val Arg Leu Leu Thr Asp Ser Val Asp Trp
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Pro Asp Leu Gly Arg Pro Arg Arg Ala Gly Val Ser Ser Phe Gly Met
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Ser Gly Thr Asn Ala His Leu Ile Val Glu Glu Val Ser Asp Glu Pro
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Val Ser Gly Ser Thr Glu Pro Thr Gly Ala Phe Pro Trp Pro Leu Ser
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Gly Lys Thr Glu Thr Ala Leu Arg Glu Gln Ala Ala Glu Leu Leu Ser
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Leu Ala Thr Gly Arg Ala Ala Met Glu His Arg Ala Val Val Val Ala
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Asp Asp Arg Asp Ser Phe Val Ala Gly Leu Thr Ala Leu Ala Ala Gly
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Ser Cys Gly Val Glu Pro Ala Ala Val Val Gly His Ser Gln Gly Glu			
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Ile Ala Ala Ala His Val Ala Gly Ala Leu Ser Leu Thr Asp Ala Val			
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Arg Ile Ile Ala Ala Arg Cys Asp Ala Val Ser Ala Leu Thr Gly Lys			
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Gly Gly Met Leu Ala Ile Ala Leu Pro Glu Ser Ala Val Val Lys Arg			
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Ile Ala Gly Leu Pro Glu Leu Thr Val Ala Ala Val Asn Gly Pro Gly			
705	710	715	720
Ser Thr Val Val Ser Gly Glu Pro Ser Ala Leu Glu Arg Leu Gln Thr			
	725	730	735
Glu Leu Thr Ala Glu Asn Val Gln Thr Arg Arg Val Gly Ile Asp Tyr			
	740	745	750
Ala Ser His Ser Pro Gln Ile Ala Gln Val Gln Gly Arg Leu Leu Asp			
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Asn Trp Glu Gln Val Phe Leu Asn Thr Gly Ala Arg Arg Val Pro Leu
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Pro Thr Tyr Pro Phe Gln Arg Gln Arg Tyr Trp Leu Glu Ser Ala Glu
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Tyr Asp Ala Gly Asp Leu Gly Ser Val Gly Leu Leu Ser Ala Glu His
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Pro Leu Leu Gly Ala Ala Val Thr Leu Ala Asp Ala Gly Gly Phe Leu
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Leu Thr Gly Lys Leu Ser Val Lys Thr Gln Pro Trp Leu Ala Asp His
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Leu Ile Arg Ala Ala Asp Gln Val Gly Cys Asp Leu Ile Glu Glu Leu
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Gln Ile Ala Val Gly Gly Pro Asp Glu Ala Gly Arg Arg Ser Val Arg
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Val His Ser Cys Arg Asp Asp Ala Val Pro Gln Asp Ser Trp Thr Cys
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Val His Ala Ala Gly Ala Leu Ala Asp Gly Val Val Glu Ser Leu Thr
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His Leu His Glu Leu Thr Leu Asp Leu Asp Leu Ser Phe Phe Val Leu
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Arg Thr Asn Pro Pro Met Ser Ala Pro Asp Gly Leu Arg Leu Phe Glu
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Met Ala Phe Arg Val Pro Gly Glu Ser Leu Leu Val Pro Val His Val
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Asp Leu Asp Gln Glu Thr Gln Leu Leu Gly Leu Val Arg Glu His Val
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Ser Ala Val Leu Gly His Ser Gly Ala Val Glu Val Gly Ala Asp Arg
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Phe Asp Tyr Pro Thr Pro Arg Ala Leu Val Arg Phe Leu Leu Asp Lys
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Gln Ala Gly Leu Phe Asp Pro Asp Pro Asp Arg Leu Gly Thr Ser Tyr
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Val Cys Glu Gly Gly Phe Leu Arg Asp Ala Ala Glu Phe Asp Ala Gly
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Arg Leu Leu Leu Glu Val Ala Trp Glu Thr Val Glu Arg Ala Gly Ile
1875 1880 1885

Asp Pro Leu Ser Leu Arg Gly Ser Arg Thr Gly Val Phe Ala Gly Leu
1890 1895 1900

Met His His Asp Tyr Gly Ala Arg Phe Ile Thr Arg Ala Pro Glu Gly
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1925 1930 1935

Arg Val Ala Tyr Ser Phe Gly Phe Glu Gly Pro Ala Val Thr Val Asp
1940 1945 1950

Thr Ala Cys Ser Ser Ser Leu Val Ala Leu His Leu Ala Gly Gln Ala
1955 1960 1965

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Met Ala Thr Pro Gly Met Phe Val Glu Phe Ser Arg Gln Arg Gly Leu
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2363

<210> 52

<211> 990

<212> DNA

<213> *Saccharopolyspora spinosa*

<220>

<221> CDS

<222> (1) .. (987)

<223> ORF23; dNTP-Glucose-4,6-Dehydratase

<400> 52

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gtt cgg cag ttg ctc ggt ggt gcg tac ccc gca ttc gcc gac gcc gac	96
Val Arg Gln Leu Leu Gly Gly Ala Tyr Pro Ala Phe Ala Asp Ala Asp	
20 25 30	
gtg gtc gtg ctc gac aag ctc acc tac gcc ggc aac gag gcg aac ctg	144
Val Val Val Leu Asp Lys Leu Thr Tyr Ala Gly Asn Glu Ala Asn Leu	
35 40 45	
gcg ccg gtc gcg gac aac ccc cgg ctg aag ttc gtc tgc ggc gac atc	192
Ala Pro Val Ala Asp Asn Pro Arg Leu Lys Phe Val Cys Gly Asp Ile	
50 55 60	
tgc gac cgc gaa ctg gtt ggc ggc ctg atg tcc ggc gtg gac gtg gtg	240
Cys Asp Arg Glu Leu Val Gly Gly Leu Met Ser Gly Val Asp Val Val	
65 70 75 80	
gtg cac ttc gcc gcc gaa acc cac gtc gac cgc tcg atc acc ggc tcg	288
Val His Phe Ala Ala Glu Thr His Val Asp Arg Ser Ile Thr Gly Ser	
85 90 95	
gac gcc ttc gtg atc acc aac gtg gtc ggc acc aac gtg ctg ctg cag	336
Asp Ala Phe Val Ile Thr Asn Val Val Gly Thr Asn Val Leu Leu Gln	
100 105 110	
gcc gcg ctc gac gcc gag atc ggc aag ttc gtg cac gtt tcc acc gac	384
Ala Ala Leu Asp Ala Glu Ile Gly Lys Phe Val His Val Ser Thr Asp	
115 120 125	
gag gtc tac ggc tcc atc gag gac ggc tcg tgg ccc gaa gac cac gcg	432
Glu Val Tyr Gly Ser Ile Glu Asp Gly Ser Trp Pro Glu Asp His Ala	
130 135 140	
ctg gag ccg aat tcc ccg tac tcg gcg gcg aaa gcg ggc tcg gac ctg	480
Leu Glu Pro Asn Ser Pro Tyr Ser Ala Ala Lys Ala Gly Ser Asp Leu	
145 150 155 160	
ctg gcc cgc gcc tac cac cgc acc cac gga ctg ccg gtg tgc atc acc	528
Leu Ala Arg Ala Tyr His Arg Thr His Gly Leu Pro Val Cys Ile Thr	
165 170 175	
cgc tgc tcc aac aac tac ggg ccc tac cag ttc ccg gag aag gtg ctg	576
Arg Cys Ser Asn Asn Tyr Gly Pro Tyr Gln Phe Pro Glu Lys Val Leu	

180	185	190	
ccg ctg ttc atc acg aac ctg atg gac ggc agc cag gtg ccg ctc tac			624
Pro Leu Phe Ile Thr Asn Leu Met Asp Gly Ser Gln Val Pro Leu Tyr			
195	200	205	
ggc gac ggg ctc aac gtg cgg gac tgg ctg cac gtc agc gac cac tgc			672
Gly Asp Gly Leu Asn Val Arg Asp Trp Leu His Val Ser Asp His Cys			
210	215	220	
cgg ggc atc cag ctg gtg gcc gac tcc ggg cgc gcg ggc gag atc tac			720
Arg Gly Ile Gln Leu Val Ala Asp Ser Gly Arg Ala Gly Glu Ile Tyr			
225	230	235	240
aac atc ggc ggc ggc acc gag ctg acc aac aac gag ctg acc gag cgg			768
Asn Ile Gly Gly Gly Thr Glu Leu Thr Asn Asn Glu Leu Thr Glu Arg			
245	250	255	
ctg ctg gca gag ctg ggc ctc gac tgg tcg gtg gtg cgg ccg gtc acc			816
Leu Leu Ala Glu Leu Gly Leu Asp Trp Ser Val Val Arg Pro Val Thr			
260	265	270	
gac cgc aag ggc cac gac cgc cgc tac tcg gtg gac cac agc aag atc			864
Asp Arg Lys Gly His Asp Arg Arg Tyr Ser Val Asp His Ser Lys Ile			
275	280	285	
gtc gag gaa ctg ggg tac gcg ccg cag gtc gac ttc gag acc ggg ctg			912
Val Glu Glu Leu Gly Tyr Ala Pro Gln Val Asp Phe Glu Thr Gly Leu			
290	295	300	
cgc gag aca atc cgc tgg tac cag gac aac cgg gac tgg tgg gag ccg			960
Arg Glu Thr Ile Arg Trp Tyr Gln Asp Asn Arg Asp Trp Trp Glu Pro			
305	310	315	320
ctg aag gcc cga tcg gcg gtg gct cga tga			990
Leu Lys Ala Arg Ser Ala Val Ala Arg			
325			

<210> 53

<211> 329

<212> PRT

<213> Saccharopolyspora spinosa

<400> 53

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1

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10

15

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Val Val Val Leu Asp Lys Leu Thr Tyr Ala Gly Asn Glu Ala Asn Leu
 35 40 45

Ala Pro Val Ala Asp Asn Pro Arg Leu Lys Phe Val Cys Gly Asp Ile
 50 55 60

Cys Asp Arg Glu Leu Val Gly Gly Leu Met Ser Gly Val Asp Val Val
 65 70 75 80

Val His Phe Ala Ala Glu Thr His Val Asp Arg Ser Ile Thr Gly Ser
 85 90 95

Asp Ala Phe Val Ile Thr Asn Val Val Gly Thr Asn Val Leu Leu Gln
 100 105 110

Ala Ala Leu Asp Ala Glu Ile Gly Lys Phe Val His Val Ser Thr Asp
 115 120 125

Glu Val Tyr Gly Ser Ile Glu Asp Gly Ser Trp Pro Glu Asp His Ala
 130 135 140

Leu Glu Pro Asn Ser Pro Tyr Ser Ala Ala Lys Ala Gly Ser Asp Leu
 145 150 155 160

Leu Ala Arg Ala Tyr His Arg Thr His Gly Leu Pro Val Cys Ile Thr
 165 170 175

Arg Cys Ser Asn Asn Tyr Gly Pro Tyr Gln Phe Pro Glu Lys Val Leu
 180 185 190

Pro Leu Phe Ile Thr Asn Leu Met Asp Gly Ser Gln Val Pro Leu Tyr
 195 200 205

Gly Asp Gly Leu Asn Val Arg Asp Trp Leu His Val Ser Asp His Cys
 210 215 220

Arg Gly Ile Gln Leu Val Ala Asp Ser Gly Arg Ala Gly Glu Ile Tyr
 225 230 235 240

Asn Ile Gly Gly Gly Thr Glu Leu Thr Asn Asn Glu Leu Thr Glu Arg
 245 250 255

Leu Leu Ala Glu Leu Gly Leu Asp Trp Ser Val Val Arg Pro Val Thr
 260 265 270

Asp Arg Lys Gly His Asp Arg Arg Tyr Ser Val Asp His Ser Lys Ile
 275 280 285

Val Glu Glu Leu Gly Tyr Ala Pro Gln Val Asp Phe Glu Thr Gly Leu
 290 295 300

Arg Glu Thr Ile Arg Trp Tyr Gln Asp Asn Arg Asp Trp Trp Glu Pro
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Leu Lys Ala Arg Ser Ala Val Ala Arg
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<210> 54

<211> 918

<212> DNA

<213> Saccharopolyspora spinosa

<220>

<221> CDS

<222> (1)..(915)

<223> ORF24; dNTP-4-keto-6-Deoxyglucose-3,5-Epimerase

<400> 54

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tcg gag ctg gcc cgg atc ctc ccc gcg cgg acg ggg gcg ctg gtg cac 96
 Ser Glu Leu Ala Arg Ile Leu Pro Ala Arg Thr Gly Ala Leu Val His
 20 25 30

cgg ccg ggt tcc ggg gaa ctg gac gtc acc gac gcc gag gag gtc gcc 144
 Arg Pro Gly Ser Gly Glu Leu Asp Val Thr Asp Ala Glu Glu Val Ala
 35 40 45

gac gcg ttg ggt tcc ttc gcg gag acg gcg aag gac gcg gag ctg cga 192
 Asp Ala Leu Gly Ser Phe Ala Glu Thr Ala Lys Asp Ala Glu Leu Arg
 50 55 60

ccg gtg gtg atc aac gcc gcg gcg tac acg gcg gtg gac gcg gcc gag 240
 Pro Val Val Ile Asn Ala Ala Ala Tyr Thr Ala Val Asp Ala Ala Glu
 65 70 75 80

tcc gac ccg gac cgc gcg gcc cgg atc aac gcc gaa ggc gcg gcc tcg 288
 Ser Asp Pro Asp Arg Ala Ala Arg Ile Asn Ala Glu Gly Ala Ala Ser
 85 90 95

ctg gcg aaa gcg tgc cgg agc agc ggt ctg ccc ctg gtg cac gtg tcg	336
Leu Ala Lys Ala Cys Arg Ser Ser Gly Leu Pro Leu Val His Val Ser	
100 105 110	
acg gat tac gtg ttc ccc ggt gat ggg gcc cgg ccg tac gag ccg acg	384
Thr Asp Tyr Val Phe Pro Gly Asp Gly Ala Arg Pro Tyr Glu Pro Thr	
115 120 125	
gac ccg acc ggg ccg cga tgc gtc tac ggg cgc acc aag ctc gaa ggc	432
Asp Pro Thr Gly Pro Arg Ser Val Tyr Gly Arg Thr Lys Leu Glu Gly	
130 135 140	
gaa cgg gcc gtg ctg gag tcc ggc gcg cgg gcc tgg gtg gtg cgc acg	480
Glu Arg Ala Val Leu Glu Ser Gly Ala Arg Ala Trp Val Val Arg Thr	
145 150 155 160	
gca tgg gtg tac ggc gcg agc ggc aag aac ttc ctg aaa acg atg atc	528
Ala Trp Val Tyr Gly Ala Ser Gly Lys Asn Phe Leu Lys Thr Met Ile	
165 170 175	
cgc ctc tgc ggg gag cgc gac acg ctg tcc gtt gtg gac gat cag atc	576
Arg Leu Ser Gly Glu Arg Asp Thr Leu Ser Val Val Asp Asp Gln Ile	
180 185 190	
ggc tgc ccg act tgg gcg gcg gac ctg gcg agc ggc ctg ctg gag ctg	624
Gly Ser Pro Thr Trp Ala Ala Asp Leu Ala Ser Gly Leu Leu Glu Leu	
195 200 205	
gcc gaa cgg gtc gcc gaa cgc cgt gga ccg gag cag aag gtg ctg cac	672
Ala Glu Arg Val Ala Glu Arg Arg Gly Pro Glu Gln Lys Val Leu His	
210 215 220	
tgc acc aat tcc ggc cag gtg acc tgg tac gag ttc gcg cgg gcg atc	720
Cys Thr Asn Ser Gly Gln Val Thr Trp Tyr Glu Phe Ala Arg Ala Ile	
225 230 235 240	
ttc gcg gaa ttc ggc ctg gac gag aac cgc gtc cac ccg tgc acg acg	768
Phe Ala Glu Phe Gly Leu Asp Glu Asn Arg Val His Pro Cys Thr Thr	
245 250 255	
gcg gac ttc ccc ctc ccg gcg cac cgc ccg gcc tac tgc gtc ctg tcc	816
Ala Asp Phe Pro Leu Pro Ala His Arg Pro Ala Tyr Ser Val Leu Ser	
260 265 270	
gac gtg gcg tgg cga gag gcg ggc ctg acc ccg atg cgc acc tgg cgg	864
Asp Val Ala Trp Arg Glu Ala Gly Leu Thr Pro Met Arg Thr Trp Arg	
275 280 285	

gaa gcc ctg gcg gcg gcc ttc gag aaa gac ggc gaa acc ctc cga acc 912
 Glu Ala Leu Ala Ala Ala Phe Glu Lys Asp Gly Glu Thr Leu Arg Thr
 290 295 300

cgc tga 918
 Arg
 305

<210> 55

<211> 305

<212> PRT

<213> Saccharopolyspora spinosa

<400> 55

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Ser Glu Leu Ala Arg Ile Leu Pro Ala Arg Thr Gly Ala Leu Val His
 20 25 30

Arg Pro Gly Ser Gly Glu Leu Asp Val Thr Asp Ala Glu Glu Val Ala
 35 40 45

Asp Ala Leu Gly Ser Phe Ala Glu Thr Ala Lys Asp Ala Glu Leu Arg
 50 55 60

Pro Val Val Ile Asn Ala Ala Ala Tyr Thr Ala Val Asp Ala Ala Glu
 65 70 75 80

Ser Asp Pro Asp Arg Ala Ala Arg Ile Asn Ala Glu Gly Ala Ala Ser
 85 90 95

Leu Ala Lys Ala Cys Arg Ser Ser Gly Leu Pro Leu Val His Val Ser
 100 105 110

Thr Asp Tyr Val Phe Pro Gly Asp Gly Ala Arg Pro Tyr Glu Pro Thr
 115 120 125

Asp Pro Thr Gly Pro Arg Ser Val Tyr Gly Arg Thr Lys Leu Glu Gly
 130 135 140

Glu Arg Ala Val Leu Glu Ser Gly Ala Arg Ala Trp Val Val Arg Thr
 145 150 155 160

Ala Trp Val Tyr Gly Ala Ser Gly Lys Asn Phe Leu Lys Thr Met Ile
 165 170 175

Arg Leu Ser Gly Glu Arg Asp Thr Leu Ser Val Val Asp Asp Gln Ile
180 185 190

Gly Ser Pro Thr Trp Ala Ala Asp Leu Ala Ser Gly Leu Leu Glu Leu
195 200 205

Ala Glu Arg Val Ala Glu Arg Arg Gly Pro Glu Gln Lys Val Leu His
210 215 220

Cys Thr Asn Ser Gly Gln Val Thr Trp Tyr Glu Phe Ala Arg Ala Ile
225 230 235 240

Phe Ala Glu Phe Gly Leu Asp Glu Asn Arg Val His Pro Cys Thr Thr
245 250 255

Ala Asp Phe Pro Leu Pro Ala His Arg Pro Ala Tyr Ser Val Leu Ser
260 265 270

Asp Val Ala Trp Arg Glu Ala Gly Leu Thr Pro Met Arg Thr Trp Arg
275 280 285

Glu Ala Leu Ala Ala Ala Phe Glu Lys Asp Gly Glu Thr Leu Arg Thr
290 295 300

Arg
305